行政院農業委員會委託研究計畫
（85 農建-12.1-企-07.1）

貿易自由化對兩岸農產貿易影響之研究
（第三年）

Projection of Future Trade of Major Agricultural Products in Mainland China: 1996-2005

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Third Year Final Report
Submitted
to

The Council of Agriculture
Executive Yuan
Taipei, Taiwan, ROC

April 1997

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貿易自由化對兩岸農產貿易影響之研究（第三年研究報告）

中國大陸主要農產品貿易之預測

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摘要

自從 1994 年美國華盛頓世界視窗 (World Watch Institute) 總裁布朗・李斯特 (Lester Brown) 發表「誰能養活中國？」一文以來，大陸政府及中外學者均熱烈地討論「到底中國能否養活自己？」及「中國應該進口多少糧食？」。本研究根據計量模型再度測定中國大陸食品需求的彈性，並應用美國農部的 CPPA 模型預測中國大陸 1996 至 2005 年主要農產品的供給、需求及其進出口潛力。

本報告分二大部份。第一部份，根據最新大陸國家統計局的資料（ 1992-1994 ），建立一個二階段 (two-stages) 的近乎理想的線性需求系統 (Linear Approximate Almost Ideal Demand System or LA/AIDS) ，從事估測大陸城鎮居民的食物需求彈性值。因為大陸在 1993 年 5 月廢止油糧配給制度，取消糧票。因此可能對食物消費結構有很大的影響。應用近期 1992-1994 年的資料，可望對這些食物需求結構性的變化，有更準確的分析。

計量估計的結果顯示，大陸城鎮的居民對大部份食品價格的變動，有甚大的敏感性。諸如米、麵粉、雜糧、牛肉、家禽肉、牛乳等，其價格彈性均大於一。以稻米為例，其價格彈性很高，不過既使在 1992-1994 年間，稻米價格增加 132.3 %（由 1992 年的 0.878 元/公斤至 1994 年的 2.045 元/公斤），城鎮居民每人平均消費量確由 1992 年的 54.97 公斤稍微增加到 1994 年的 55.01 公斤。相對而言，城鎮居民每人平均所得由 1992 年的 1,826 元增加到 1994 年的 3,179 元（增加了 74 %）。這個消費結構顯示，如果稻米所得彈性不是很大，那麼， 1992 年到 1994 年稻米價格的高漲，應該會造成平均消費量大量減少才對。這是為什麼我們估測出來的稻米需求所得彈性也跟價格彈性一樣高的原因。大陸各種食物需求彈性值相當高，這是預測未來食物消費結構的最大難題。因為彈性高，需求的預測極具敏感度。

在本研究中，食物需求的計量模型依全國及各地區分別測定。結果顯示，地區性的差別很大。一般而言，沿海地區的城鎮居民比內陸地區消費較多蔬菜、水果、家禽肉、水產品及牛乳。各地區估測的需求彈性，也相差很大。計量結果顯示，近年來大陸城鎮居民食物需求結構，有很大的變化。因此食物需求彈性值的測定，仍須以更新的資料，繼續驗證。

本報告第二部份，討論研究計畫中，預測大陸未來主要農產品供需平衡及進出口分析的結果。本研究使用的預測模型是根據美國農部所建立的 CPPA 模型（中國國家預測及政策分析模式）。依據本研究估測的需求彈性值，調整 CPPA 模式原來使用但沒有經過確認的彈性值。另外，我們對 CPPA 模式裡基期所用的各種食物消費量，也作一番考證。例如城市居民調查統計資料顯示，每人平均肉類消費數量近年來並無增加的趨勢。因此計量分析的結果：豬肉需求的所得彈性很低。這個結果與其他經濟學家認定中國大陸在所得增加後將大量消費肉類的看法有點差異。不過資料也顯示，大陸城鎮居民及鄉村居民食物消費結構有很大差異。因此大陸未來食物需求的決定因素之一將是鄉村到城市人口的移動。對未來農產品供需的預測，必須把握住人口流動的預測。

本研究在作預測時，採用幾個模擬（ Scenarios ），依據不同農產品單位產量的假設，不同的城鄉人口移動以及不同的經濟成長（所得變動）趨勢預測未來（ 1996-2005 年）農產品的供需及農產貿易。

預測分析結果如下：

一、根據基本的模擬（ Base Scenario ），CPPA 模式預測的結果顯示，大陸在 2005 年將淨進口 3,830 萬噸的穀糧。其中

2,080 萬噸是玉米，還有 1,440 萬噸是小麥。雖然大陸在 2005 年可能出口 150 萬噸的稻米，不過稻米淨出口量只有 18 萬噸。未來大陸的稻米出口會不會影響台灣稻米的產業？這不是一個簡單可以回答的問題。不過根據我們的觀察，大陸近年來一方面出口品質較佳的米，同時進口品質較劣的米。更重要的是，大陸出口的優質米是在東北生產，而稻米的進口主要是在南方省分像廣東、福建。因此大陸的稻米貿易是北方出口，南方進口。大陸東北與日本較為接近，加上日本對優質米的需求，近年來，大陸出口的米大多數銷到日本。具體而言，在 1994 年，94％從大陸出口的稻穀（1千7百萬公斤)銷售到日本，同年 6 億 4 千萬公斤的糙米出口到日本，佔全部大陸糙米出口的 98.7％，另外，大陸出口到日本的精米是 4 億 2 千 2 百萬公斤，佔其全部出口的 49 ％。因此大陸如果可以出口優質稻米應以日本為主要市場。另外，台灣在加入 WTO 後，稻米的市場也會採取漸進開放的方式。因此我們認為台灣未來的稻米產業將不至於受到大陸稻米出口很大的影響。

二、根據預測在 2005 年大陸將有少量豬肉的出口（在 30 萬噸左右），雞肉及家禽大致上是自給自足。這個預測結果基本上是根據我們的假定，大陸仍繼續延續目前的農業政策，寧願進口飼料糧，不進口肉類。

三、假如大陸城市化較快時（也就是說城市居民增加率較大時），CPPA 模式預測結果顯示，大陸穀物的進口量將減少，稻米的出口也會減少，豬肉的出口可能稍為增加。這個預測結果與我們想法有些出入。主要原因在於 CPPA 模式中，基期的平均肉類消費量，城市居民及鄉村居民均採用同樣的平均值。這是此模型今後須要修正的一大重點。我們已向美國農部反應以便進一步改進這一部分的 CPPA 模型。

四、所得的成長會影響未來食物的消費，更進一步影響農產品供需的平衡。如果人均 GDP 的每年成長率由 7 %提高到 10 %，預測結果顯示，大陸在 2005 年穀糧（包括飼料糧）的進口將由 3,830 萬噸增加到 6,100 萬噸，（其中 1,920 萬噸是小麥， 3,830 萬噸是玉米）。因此大陸未來經濟成長的高低是決定其農產品進出口的很重要因素。

五、根據我們預測結果，大陸未來必須進口小麥及玉米（飼料糧）是毫無疑問。但是進口量並沒有布朗博士預測的那麼高（他預測大陸在 2005 年必須進口 1.08 億頓，在 2030 年必須進口 3 億噸的穀糧）。

這些預測的結果，對未來兩岸農產貿易有何啟示？我們認為大陸對糧食安全及糧食自給自足的政策在短期內不會放棄。要維持糧食的增產，大陸必須向農民施加壓力，不得將太

多農地轉種其他經濟作物。雖然 1996 年大陸糧食大豐收，但其最大的原因是這幾年來糧食價格的激增。大陸糧食價格能否繼續上昇，目前還是一大變數，特別是在大陸加入 WTO 之後，大陸將不能保證糧價。糧食的增產會受到很大的限制。另一方面，根據本計畫第二年研究的結果，在沿海地區，勞動密集的經濟作物像蔬菜，因鄉村企業的發展，鄉村勞動力的轉移和工資上揚，經濟作物增產的潛力將受到很大的限制。再者，大陸人民所得的提高，食物需求結構的變化，未來必須進口大量穀物。特別是沿海地區，未來農業生產萎縮，食物需求比其他地區增長快速，糧食及穀物的短缺比其他區域會更加嚴重。因此，未來（特別是在 2005 年後）大陸農產品傾銷臺灣的可能性非常低。

Projection of Future Trade of Major Agricultural Products in Mainland China: 1996-2005

Abstract

This report is prepared for the Council of Agriculture, Executive Yuan, Taipei, Taiwan. This study comprises of two parts. In the first part, the effort is made to investigate the latest development of food consumption behavior in urban Mainland China. A two-stage LA/AIDS model with different specifications in terms of time period and regional coverage is used to estimate food demand elasticities with the aggregated provincial household data from the State Statistical Bureau, Mainland China. The results show that most food items are price elastic, reflecting that the Chinese consumers are becoming more responsive to price signals in their food consumption. The surging grain prices and high grain price elasticities are the main reasons for the decreases in grain consumption observed in recent years. Chinese urban consumers are expected to increase their spending on fruits, vegetables, spirits, and cigarettes, poultry, and aquatic products when their income increases. However, the grain consumption will still account for a large portion of consumers' additional income, though its consumption in quantity will decrease.

The empirical results also display the differences in consumption behavior among regions and structural changes over time. In recent years, urban Chinese consumers spent more on meat but less on grain when their income rose. Consumers in the coastal region tend to spend more on vegetables, fruits and melons, poultry, aquatic products, and fresh milk than those in the inland region.

In part two of the study, we incorporate our estimates of food demand elasticities from the first part of this study and other estimates available in the literature into the CPPA-

Mainland China model---a simulation model developed by the Economic Research Service of U.S. Department of Agriculture. Using alternative assumptions on the growth rates of the yields of major crops, urbanization and income growth, we develop five scenarios to simulate agricultural production, consumption, and trade in Mainland China for the next 10 years. The results indicate that Mainland China is expected to import a large quantity of grains, especially coarse grain, and the import volume will be more than twice as much as the largest import volume in its history, i.e., more than 38 million tons by 2005. A higher economic growth will increase the net import quantity of grains to 61 million tons in 2005. However, our results also show that grain import will be far less than 300 million tons by year 2030 as projected by Lester Brown.

Our projection shows that Mainland China may export up to 1.54 million tons of rice by 2005. This figure may seem very high in comparison to Taiwan's domestic production of 1.57 million tons in 1996. However, we note that the projected net export of rice in 2005 is only 0.18 million tons. It is not obvious whether or not the projected rice export from Mainland China will impact the rice sector in Taiwan. In recent years, Mainland China has been exporting high quality rice from the northeast region and importing lower quality rice in the south. Due to its vicinity to China's northeast region and its strong demand for high qaulity rice, Japan has been the major market for China's rice export. For example, in 1994, Japan imported 640 million kg of husked rice from Mainland China, representing 98.7% of China's total export of husked rice. In the same year, almost half of Mainland China's exported fine rice (422 million kg) went to Japan. Therefore, if Mainland China continues to export rice in the future, it should target Japan as its major market. In addition, even after Taiwan joins WTO, its rice market will be opened only gradually. Our view is that Taiwan's rice sector will be more likely affected by the world market situation than the possible export from Mainland China.

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of beef has increased rapidly from 16 thousand tons in 1983 to 132 thousand tons in 1991, and then it dropped sharply to 17 thousand tons in 1993. The export of live poultry has increased slowly but steadily with an average growth rate of 8.92 percent per year. The exports of live swine and eggs have both decreased during 1983-1993. For other products, the export of fruits increased form 0.19 million tons in 1983 to 0.49 million tons in 1993 with an average growth rate of 9.6 percent per year. The export volume of sugar surged in 1992 and 1993 with its export volume to be about 1.6 million tons.

On the import side, food grain has experienced a cyclic trend. After some fluctuations, total grain imports declined from 16.28 million tons in 1987 to 7.34 million tons in 1993. However, in 1994, it increased to 17.9 million tons due to the unprecedented increase in corn imports of about 4.3 million tons, and the resumed normal import volume of wheat with more than 10 million tons. This situation reflects the increasing pressure on grain market in Mainland China. Taking 1994 as an example, even though Mainland China imported almost the largest volume of grain in history, the imported grain still only accounted for about 5 percent of total domestic production or consumption. That is to say, Mainland China has successfully maintained a grain self-sufficiency ratio of above 95 percent in recent years. Nevertheless, there are many apparent reasons to doubt that Mainland China can maintain this high ratio in the future.

Mainland China also imported large amounts of edible oil and fertilizer. The total import volume of edible oil decreased rapidly in the early 1990s. After reaching its climax points in 1991 and 1992 with about 18 million tons, imports of fertilizer also declined in 1993, but remained above 10 million tons.

In all, the Chinese agriculture has experienced stagnation during the recent ten years. The declining trends of arable areas and sown area for major crops, ever increasing population, and transformation of food consumption behavior will place more pressure on grain production. However, the production of cash crops as well as meats has increased rapidly during this period to keep pace with the changing food consumption behavior. Agricultural trade fluctuated greatly during the same time period. Statistical data show that it is unlikely China will expand grain exports very much in the future.

CHAPTER I

INTRODUCTION

1.1 An overview

This report documents the third year's research findings for the project entitled, "Analysis of Agricultural Trade Relationship Between Taiwan and Mainland China under GATT" , undertaken for the Council of Agriculture, Executive Yuan, Taipei, Taiwan. During the third year, the research focus is on the development of a forecasting model for analyzing the future grain import in Mainland China, a subject being heatedly debated in recent year. The ability for Mainland China to fulfill its long standing policy on self-sufficeicy in grains will have important implications for the future agricultural trade relationship between Mainland China and Taiwan.

In 1995, the Chinese economy has quadrupled since the reform policies were initiated in 1978, with an average annual growth rate of 9 percent. Rural reform, along with its pioneering Household Responsibility System, has transformed the Chinese agricultural production from central planning to a market-driven system. Benefiting from these policy incentives, agricultural production has increased rapidly with an annual growth rate of around 5 percent for grain during the first half of the reform period (1978-1984). However, during the second half of the reform period (1985-1994), deeper and more acute problems concerning agricultural production in Mainland China began to emerge. These problems include the lack of further policy stimulus for agricultural production, absence of economies of scale in farming in the present system, long existing price discrimination between industrial and agricultural products, the weak infrastructure, and the low input in agricultural industry

as well as in research development and extension education. Afflicted with these difficulties, agricultural production increased only about 1 percent per year during this period.

On the other hand, from the consumers point of view, the major benefit of rapid economic development comes down to the fact that consumers have much more income to spend in a more free market. Several recent studies have already shown that the economic development and rising income have had many profound impacts on food consumption behavior in Mainland China. People now tend to consume more high quality products such as poultry, fish and fruits. However, in terms of grain consumption efficiency, the consumption of meats, which are converted mostly by feed grains, is far less efficient than direct consumption of grain. This means that more demand for meat and dairy products may signify even greater demand for grain, especially feed grain in Mainland China in the future. This may place a huge pressure on the presently stagnant agricultural production. The situation may be further aggravated by the decreasing arable land lost to the industrialization and the ever increasing population of 13-14 million per year despite its well publicized and controversial birth control policy. Since Mainland China represents the largest market for agricultural products in the world, Chinese agricultural production, food consumption and demand, food security, as well as trade potential have received much attention among researchers both in Mainland China and abroad.

This attention climaxed after the publication of Dr. Lester Brown's famous paper entitled "Who Will Feed Mainland China?", claiming that by the year 2030, Mainland China's agricultural production will lag far behind its domestic demand with a grain supply deficit of 378 million tons, and total import demand will exhaust the world grain market surplus. The article not only shocked the policy decision makers in Mainland China, it also aroused heated debates among scholars who are interested in Chinese issues.

1.2 Objectives and Organization

This study intends to contribute to the present literature by providing a more recent insight into food consumption behavior of Chinese consumers, and by using an agricultural supply and demand model to verify the validity of Dr. Brown's projection. As the Chinese economy continues on its pace towards a market economy, market forces will play an

increasingly important role in the economy. Consumption, as a guiding force of the market, will certainly affect the demand side as well as supply side of the economy. As a result, it is essential to understand consumption behavior, as well as its effects on other important economic issues such as production and trade.

Since the founding of The People's Republic of Mainland China, the Chinese population has been mandatorily divided into two parts: rural residents and urban residents by the registration procedures. Remarkable difference in food consumption behavior exists between rural and urban residents. Urban residents consume much more meat, dairy products, and fruits while consumers in rural areas consume almost twice as much as grain products as compared with their urban compatriots. There are many reasons behind these differences. One obvious factor is the difference in income. The other important factor may be the market development status. Due to limited market access , rural residents have to reduce the consumption of commodities which are highly reliant on the market supply such as meat and dairy products, and consume more products produced on their own farm land, such as grain and vegetables. This behavior is further reinforced by the prevalent Confucian ideology in the countryside, emphasizing self-sufficiency on everything. Another contributing factor may be that, unlike urban residents, for whom their working units provide them housing, rural residents have to build houses by themselves. Rural housing was very shabby before the reform was initiated in 1978. To this date, rural residents may still be in the stage of rebuilding or renovating their houses, and spend large portions of their income on elevating their housing condition. It is believed that when they have achieved a certain degree of satisfaction in housing, they may put more resources into food quality improvement.

The wide difference in consumption behavior necessitates the separate estimation of food demand for urban and rural regions. However, as we have mentioned above, Chinese food consumption behavior has been distorted by many non-market factors in the rural region, at least in the present stage. In contrast, there are fewer market interventions from the government in urban regions. Food rationing, the major form of policy distortion in urban areas, was eliminated in 1993. Urban consumption behavior can be approximated as a result

of market forces, and consumers in urban areas can be treated as utility maximizers subject to their income constraint. Considering the limited or unavailable information and data about the effects of distortion of non-market forces on consumption behavior in rural area, this thesis will focus only on the analysis of urban food consumption. This is also justified by the belief that, as the Chinese economy develops continuously, and its market becomes more mature, the consumption behavior of rural households will become more and more similar to urban residents. Furthermore, the increasing trend of urbanization will help narrow the difference between urban and rural areas.

In order to verify Brown's claim, we will use the Country Projections and Policy Analysis (CPPA) model for Mainland China, a simulation tool developed by the Economic Research Services (ERS) of the United States Department of Agriculture (USDA), to simulate production, consumption, and trade prospects in the next ten years, incorporating newly estimated demand elasticities reported in this thesis.

The report consists of two parts. In the first part, the demand elasticities for major food items are estimated. In the second part, the production and trade potential are simulated. Specifically, the report is organized as follows. In Chapter II of the report, descriptive analysis is carried out to show the historic trends of agricultural production, trade, and food consumption behavior in urban areas in Mainland China during the reform period. Statistical data show that agricultural production for the major crops has been stagnating during recent years, while production for non-staple products such as meat products and fruits has been increasing very rapidly. Agricultural trade has experienced some fluctuations. It is difficult to foresee that large increases in grain exports will happen in the future. On the contrary, Mainland China is most likely to import a lot of grains, especially feed grain in the future. As to food consumption, the year 1994 was the first year when the Engel coefficient in Mainland China was below 50 percent, indicating the improving standard of living in urban areas. Even though Chinese urban consumers have reduced grain consumption considerably during the last ten years, its expenditure share did not decline much, due to surging grain prices. However, expenditure shares for meats have been declining since 1989.

In Chapter III, we carry out a literature review. Chapter IV develops the theoretical

framework for the estimation of demand and expenditure elasticities for urban Chinese residents, using the data collected by the State Statistical Bureau (SSB) of Mainland China for 1985-1994 or 1992-1994. The Almost Ideal Complete Demand System (AIDS) is applied in the study. A two-stage AIDS model is used to analyze the eight food groups in the first stage, and eight food items respectively in the meat and grain subgroups in the second stage. Different model specifications in terms of time period and regional coverage are carried out to uncover potential regional effects and structural changes over time. In Chapter V, the data and estimation procedures are discussed, and the results from the estimation are also presented. The econometric results show that most food items are price elastic, reflecting that Chinese urban consumers became more responsive to price signals when they were able to make choices in food consumption. Chinese consumers are expected to spend more on fruits and melons, vegetables, spirits, cigarettes, poultry, and aquatic products when their income further increases. We also find that urban consumers in recent years spent more on meats and less on grain. Consumers in the coastal region tend to spend much more on vegetable, fruits and melons, poultry, aquatic products, and fresh milk than those in inland regions.

The second part of the report begins with Chapter VI, the general structure of the CPPA as well as CPPA-Mainland China model is introduced in this Chapter. With the new demand elasticities obtained from this study, and the elasticities from other available literature, the major assumptions and scenario analysis are developed and presented in Chapter VII to simulate scenario forecast for agricultural products, especially grains. The basis for scenario simulation are yield growth rates for major crops, and the urbanization rate. The simulation results show that Mainland China is likely to import large quantities of grains, especially feed grain in the future. However, Mainland China is unlikely to starve the world. The conclusions and implications from this study are presented in Chapter VIII.

CHAPTER II

HISTORIC REVIEW OF CHINESE AGRICULTURAL PRODUCTION, TRADE, AND URBAN FOOD CONSUMPTION

This chapter is divided into two sections. In the first section, data for total arable land, agricultural production of major products, as well as export and import volume of agricultural products are presented and analyzed. Some relevant articles are also reviewed to give a better understanding of the agricultural situation in Mainland China. In the second section, historic trends of food consumption by urban consumers for 1987-1994 are studied. Both consumption and expenditure data are presented and analyzed.

2.1 Historic Trends of Agricultural Production and Trade

2.1.1 Areas Under Cultivation

Table 1 shows that during 1978-1993, there was a loss of about 5 percent of total cultivated areas, with an average decreasing rate of 0.29 percent each year. The decreasing trend of cultivated area is obvious from the data in the second column of Table 1 and Figure 1. The magnitude of land loss was very high during the mid_1980s, and was somewhat lower by the end of the decade. In the 1990s, the loss of cultivated land continued its trend. Correspondingly, the total sown area decreased in the mid_1980s, and recovered in early 1990s. One should note that, besides the decrease in the total cultivated and sown areas, the percentage of sown area allocated to grain also declined from 80.33 percent in 1978 to 74.80 in 1993 (Figure 2). The slight increase in sown area for wheat could not offset the large drop in sown area for rice during this time period. This data shows that the increase in agricultural output has been mainly contributed by the increase in productivity.

Table 1
Areas Under Cultivation, China, 1978-1995
(1,000 hectares)

Year	Cultivated areas	Change from previous year	Total Sown Area	Grain Crops Sown Area	Change from Previous Year	Sown Area for Rice	Sown Area for Wheat
1978	99389.5	-800.9	150104	120587	a	34421	29183
1980	99305.2	-940.8	146379	117234	a	33879	29228
1983	98359.6	-768.0	143993	114047	a	33137	29050
1984	97853.7	-505.9	144221	112884	-1163	33179	29577
1985	96846.3	-1007.4	143626	108845	-4039	32070	29218
1986	96229.9	-616.4	144204	110933	2088	32266	29616
1987	95888.7	-341.2	144957	111268	335	32193	28798
1988	95721.8	-166.9	144869	110123	-1145	31987	28785
1989	95656.0	-65.8	146554	112205	2082	32700	29841
1990	95672.9	16.9	148362	112466	261	33064	30753
1991	95653.6	-19.3	149586	112314	-152	32590	30948
1992	95425.8	-227.8	149007	110560	-1754	32090	30496
1993	95101.4	-324.4	147741	110509	-51	30355	30235
1994	94906.7	-194.7	148241	109544	-965	30171	28981
1995	94970.9	64.2	149879	110060	516	30744	28860

[a] Data are not available.

Source: State Statistical Bureau, *Statistical Year book of China*, 1994-1996.

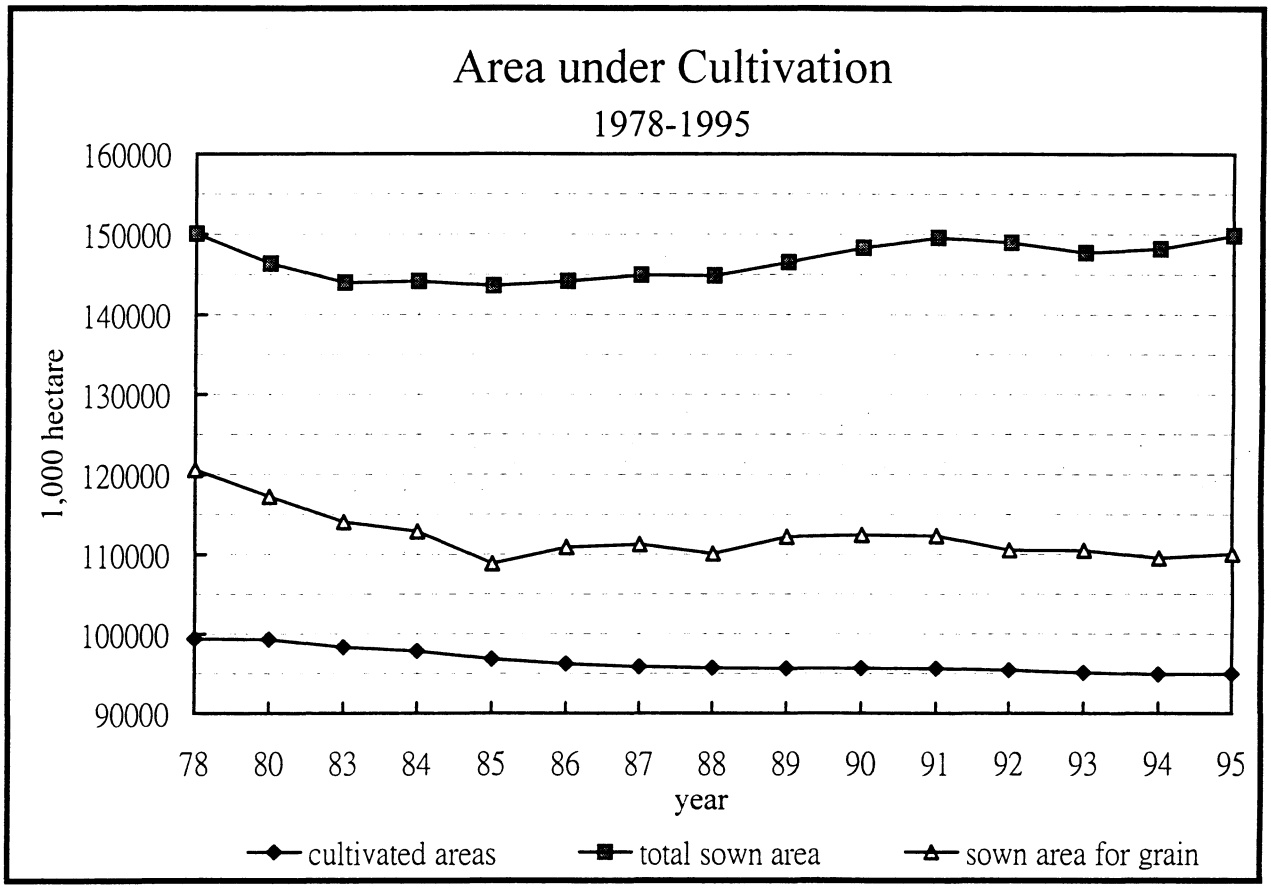

Figure 1. Area under Cultivation, 1978-1995.

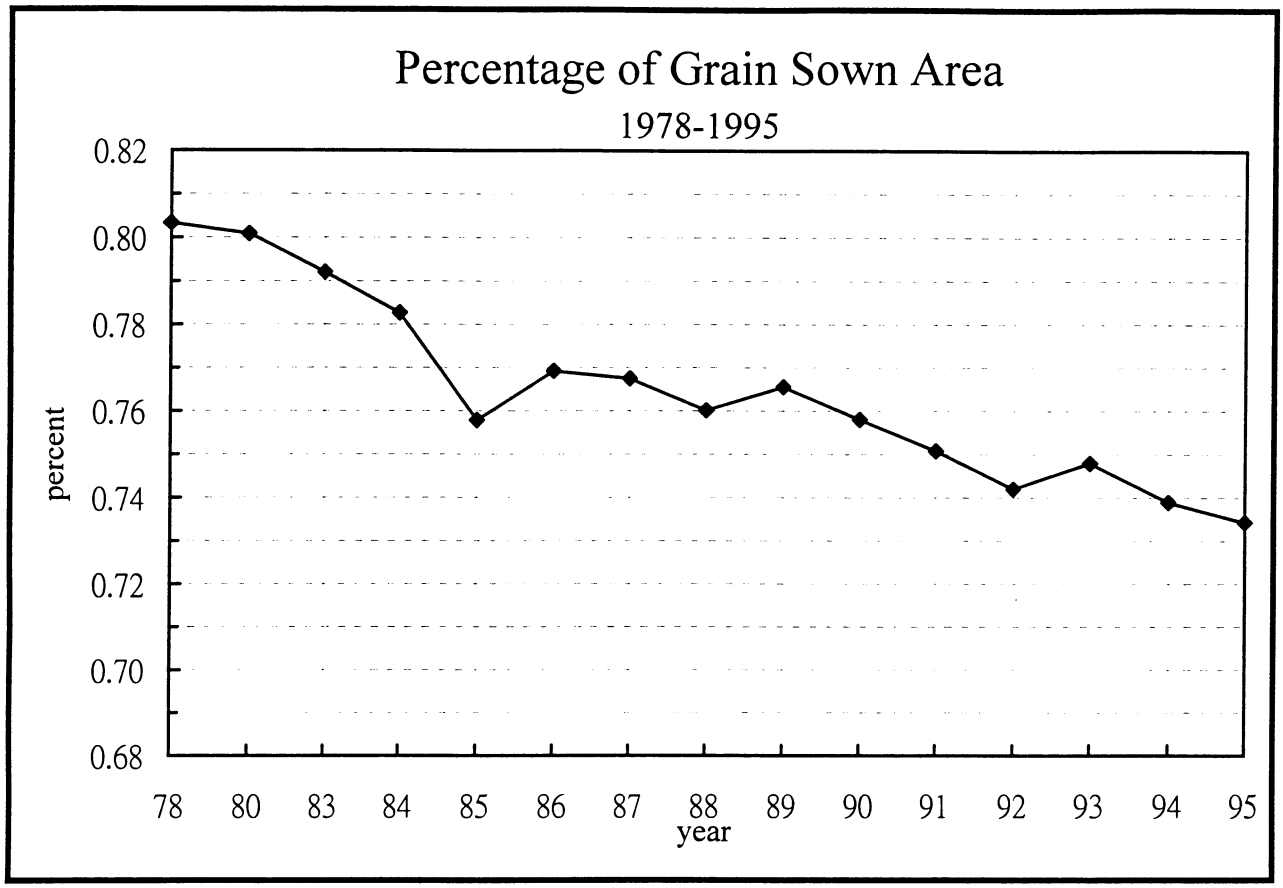

Figure 2. Percentage of Grain Sown Area, 1978-1995.

2.1.2 Stagnation of Agricultural Crop Production During the Past Ten Years

The adoption of the Household Responsibility System in 1978 signaled the beginning of Mainland China's well-known rural reform. Since then, agricultural production has changed dramatically from a central planning to a market-driven system. In terms of the growth of agricultural production, the reform period can be divided into two stages. In the first period from 1978 to 1984, total grain production increased rapidly from 304.77 million tons in 1978 to 407.31 million tons in 1984 with an average annual growth rate of 4.95 percent (Table 2). However, after 1984, growth in total agricultural production slowed down with an average growth rate of about 1.15 percent from 1984 to 1993. Many scholars believe that the rapid growth in the first stage was attributed to the one-time contribution of the Household Responsibility System. After 1984, the growth depended much more on technology improvement (Zhu 1993; Fan 1991) which was not present. The loss of production efficiency, loss of skilled labor to other industries, low profitability, lack of economies of scale, and deceased government investment are jointly responsible for agricultural production stagnation (Zhang, and Carter 1994).

From the perspective of per capita grain production (i.e., total grain production divided by population), the situation is far from optimistic due to an ever increasing population, with an annual increase of about 13-14 million people. Per capita grain production reached its peak of about 390 kg per capita in 1984, and this figure has not been surpassed since (Table 2, and Figure 3). From the latest information available, total grain production reached 465 million tons in 1995, however, the per capita grain production would still be less than that in 1984, due to the large increase in population. The non-existing momentum for further increases in per capita grain possession may put increasing pressure on the grain market as Chinese consumers transform their consumption behavior to consume more meat products, which will require more grains, especially feed grains.

Parallel to the growth in total grain production, the production of rice and wheat increased rapidly during the first stage, and slowly in the second stage (Table 3 and Figure 4). For rice, production increased very slowly from 178.26 million tons in 1984 to 189.33 million tons in 1990. However, it dropped back to 177.70 million tons in 1993. In general,

there was no output increase in rice during the past 16 years. For wheat, production increased rapidly from 53.84 million tons in 1978 to 73.41 tons in 1984 with an average annual growth rate of 8.5 percent per year. The increase slowed down afterward with a growth rate of 2.7 percent per year during 1984-1992. Recently, however, the production of wheat decreased in 1994.

With respect to other crops, production of corn has increased steadily with an annual growth rate of 3.8 percent during 1978-1994, though these increases may still lag behind the increasing demand induced by the rapidly developed animal husbandry industry. Oil bearing crops production experienced a slump during 1988-1989, but quickly recovered and has increased rapidly ever since. It had an average growth rate of 8.6 percent during 1978-1993. Cotton production, which is highly sensitive to the textile industry, fluctuated greatly during this period, partly due to the severe occurrence of bollworm in recent years, and partly due to its labor intensive nature and thus, tight relation to labor market fluctuation.

2.1.3 Rapid Increase of the Outputs of Cash Crops and Meats

In sharp contrast with grain production, fruit production has almost tripled from 9.8 million tons in 1984 to 30.1 million tons in 1993, representing an annual growth rate of 13.2 percent. The 1993 production of pork was also twice as much as that in 1984 with a growth rate of 7.86 percent per annum from 1984 to 1993 (Figure 5). Other meat products such as beef, mutton, poultry, fish, and eggs also increased rapidly, with annual growth rates of 22.6, 9.9,17.3, 8.5, and 11.8 percent, respectively during the same period (Figure 6). The significant increase in nonstaple food products reflects the surging increase in the demand for high quality food during recent years, signaling the transformation of Chinese consumers.

Table 2
Total Grain Production and Per Capita Grain Production, China, 1983-1993

Year	Grain Production	Population	Per Capita Grain Production
	10,000 tons	10,000 persons	kg/persons
1978	30477	96259	316.61
1980	32056	98705	324.77
1983	38056	103008	369.45
1984	40731	104357	390.30
1985	37911	105851	358.15
1986	39408	107507	366.56
1987	40755	109300	372.87
1988	39408	111026	354.94
1989	40755	112704	361.61
1990	44624	114333	390.30
1991	43529	115823	375.82
1992	44265.8	117171	377.79
1993	45648.8	118517	385.17
1994	44510.1	119850	371.38

Source: State Statistical Bureau, China, *Statistical Year book of China*, 1994-1995.

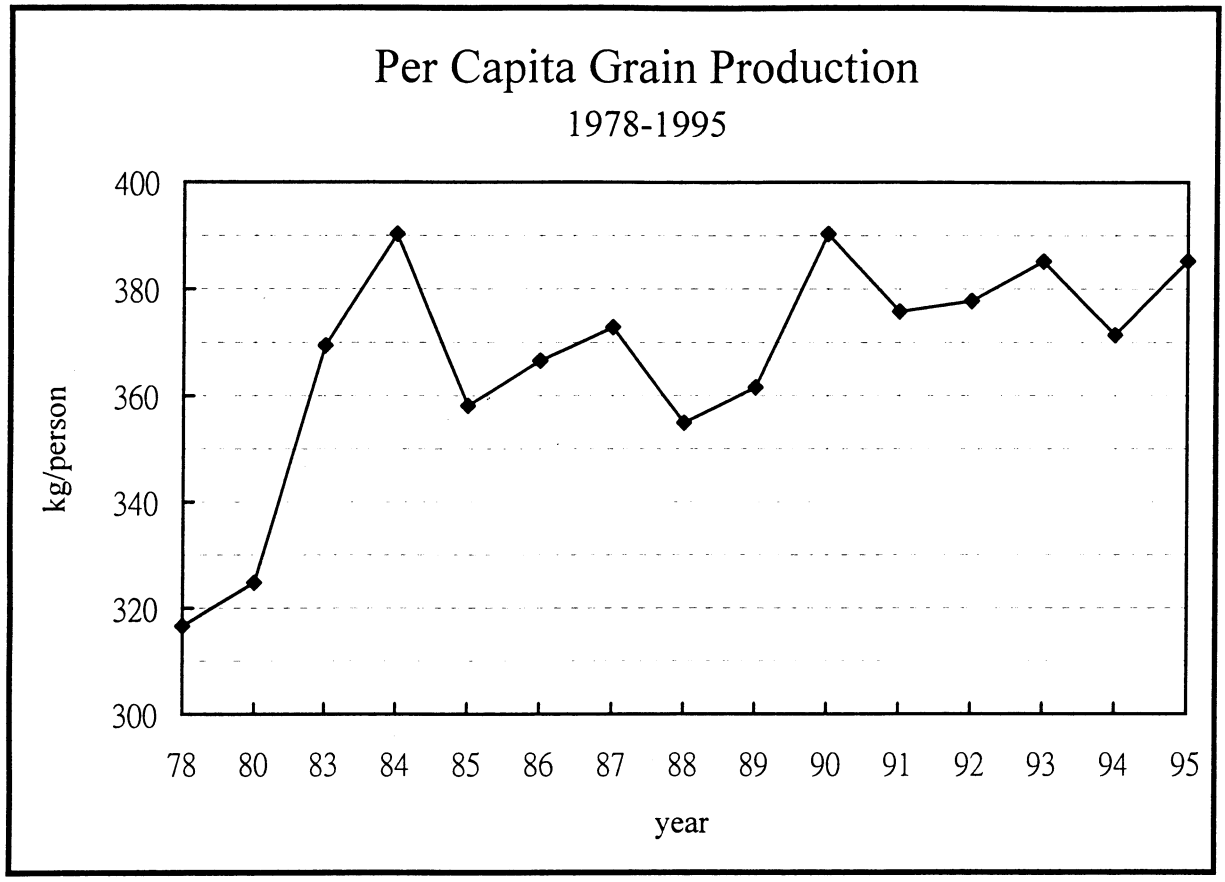

Figure 3. Per Capita Grain Production, 1978-1995.

Table 3

Output of Major Agricultural Products in China, 1978-1995

Unit: 1,000 tons

year	grain	rice	wheat	corn	oil-bearing crops	cotton	fruits	pork	beef	mutton	poultry	fish
1978	304770	136930	53840	55950	5218	2167	6569.700	a	a	a	a	25640
1980	320560	139910	55210	62600	7691	2707	6792.550	11341	269	444	a	23412
1983	380560	168870	81390	68210	10550	4637	9487.050	13161	315	545	a	25137
1984	407310	178260	87820	73410	11910	6258	9845.300	14447	373	586	a	26727
1985	379110	168570	85810	63830	15784	4147	11639.456	16547	467	593	1602	27453
1986	394080	172220	90040	70860	14738	3540	13477.471	17960	589	622	1879	30940
1987	407550	174260	85900	79240	15278	4245	16679.158	18349	792.	719	2194	35160
1988	394080	169110	85430	77350	13203	4149	16661.004	20176	958	802	2744	36290
1989	407550	180130	90810	78930	12952	3788	18319.316	21228	1072	962	2820	38300
1990	446240	189330	98230	96820	16132	4508	18744.222	22811	1256	1068	3229	42320
1991	435290	183810	95950	98770	16383	5675	21761.256	24523	1535	1180	3950	46620
1992	442658	186222	101587	95383	16412	4508	24400.930	26353	1803	1250	4542	51760
1993	456488	177510	106390	102704	18039	3739	30112.154	28544	2336	1373	5736	55739
1994	444500	175930	99299	99277	19896	4341	34998.000	32048	3270	1609	7552	6473.7
1995	466620	185230	102210	111990	22503	4768	42146.000	36484	4154	2015	9347	7581.0

[a] Data are not available.

Source: State Statistical Bureau, *Statistical Year book of China*, 1994-1995.

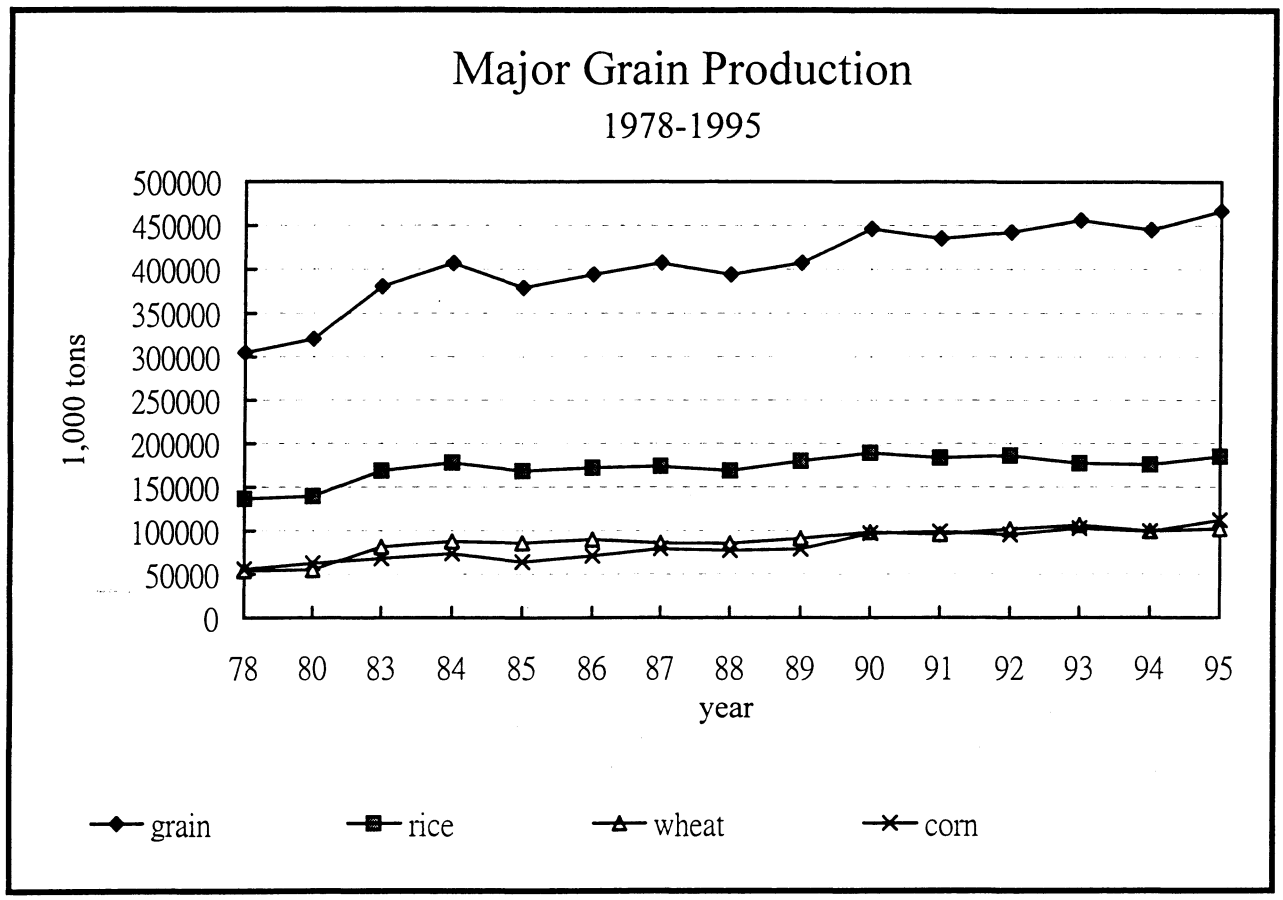

Figure 4. Major Grain Production, 1978-1995.

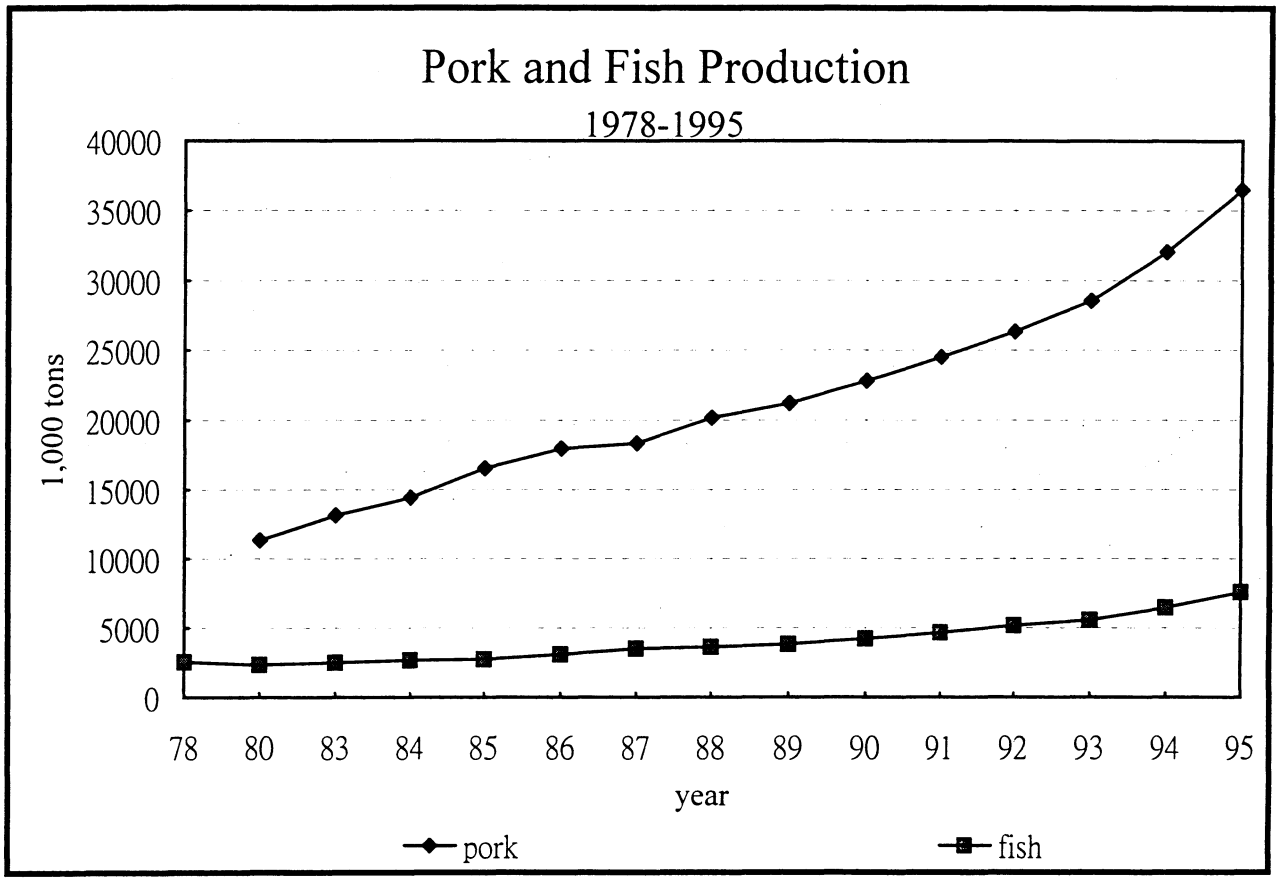

Figure 5. Pork and Fish Production, 1978-1995.

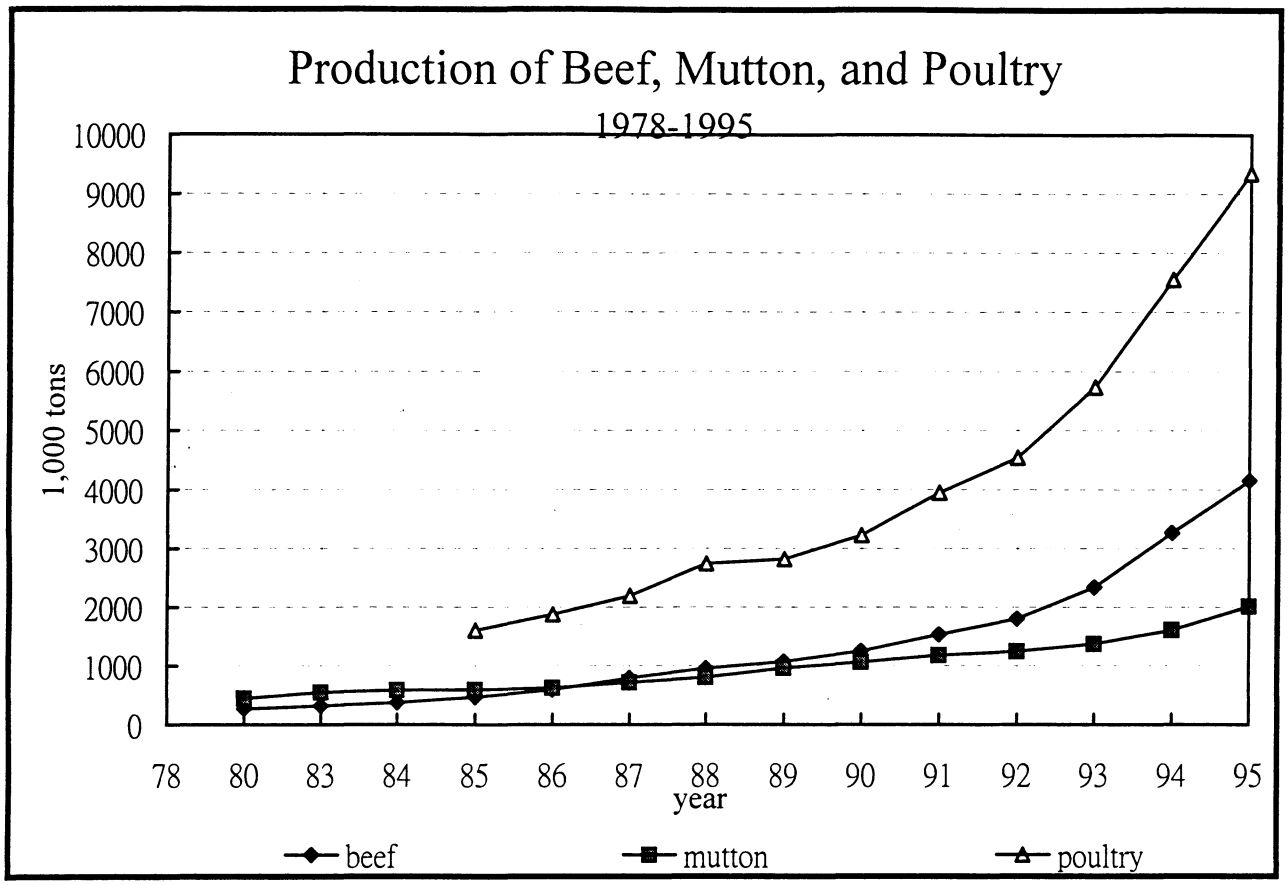

Figure 6. Production of Beef, Mutton, and Poultry, 1978-1995.

2.1.4 Assessment

Agricultural production capability in Mainland China has been widely studied by scholars. Doubtlessly, the decreasing trend of cultivated land will be one key factor affecting the potential for grain production increases in the future. While it is almost impossible to reverse this trend, the government is apparently adopting measures to slow down this trend. Furthermore, as most scholars have realized, further increases in agricultural production in Mainland China will mostly come from increases in productivity, as experienced during the past decade. One report released by The Chinese Academy of Social Science claims that: "The unit yield of two third of total arable land is still in the range of low to middle productivity from the world standard. If accompanied with appropriate biological measures and more agricultural inputs, the yield can be increased by 50-75 kg per MU (15 MU equals to 1 hectare). In total, grain production can be increased by 39 million to 57 million tons. In addition, there are still large amounts of land that can be reclaimed. As a result, it is quite possible to maintain an average growth rate of about 2 percent to the early next century. That is, by the end of this century, total grain production will reach 520-520 million tons, and by the year 2030, total grain production will reach 540-550 million tons. With a total population of about 1.3 billion and 1.5 billion in year 2000 and 2030 respectively, per capita grain production will remain at about 400 kg ."

Another report released by the Ministry of Agriculture (XinHua News Agency, March 29, 1996) also confirms the above proposition. It indicates that there is great potential to improve the yield for most crops when compared with the highest yields achieved in other countries. Rice yield in Mainland China in 1994 is about 358 kg per MU, only about 64.4 percent of that of Australia, while yield of wheat is 230 kg, about 38.4 percent of that in Holland. The yields of other crops also have much room to improve. With enough attention paid to research, extension, and investment, grain production can be significantly increased.

However, there are many barriers to prevent the above-mentioned potentials from being realized. The high cost of land reclamation may make the expansion of arable land an unrealistic practice, and the prevalent low input rate in agricultural research and education may deter the growth in yield increase. Other factors such as shortage of water, obsolete

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貿易自由化對兩岸農產貿易影響之研究
（第三年）

Projection of Future Trade of Major Agricultural Products in Mainland China: 1996-2005

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Third Year Final Report
Submitted
to

The Council of Agriculture
Executive Yuan
Taipei, Taiwan, ROC

April 1997

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The Ohio State University

irrigation systems, worsening ecological system, and low level of transformation of scientific improvement into production will also hinder the process of production increase. Finally, and maybe most importantly, the rapid change in food consumption behavior, which results in higher grain demand (both directly and indirectly consumed) places huge pressure on grain production. One has to ask if Chinese grain production can still keep pace with its market demand, and if it is still realistic or economic to maintain the goal of self-sufficiency in grain in the future, or what kind of self-sufficiency rate can be reasonably achieved, and what is the agricultural trade potential in the future? The systematic simulation to be conducted in the second part of the thesis may shed some light on this issue.

2.1.5 Agricultural Trade Policies

In order to understand agricultural production and trade in Mainland China, we must understand the policies surrounding them. Self-sufficiency can be deemed as the core theme in formulating agricultural policies as well as trade policies since the founding of the People's Republic of Mainland China in 1949. Every effort has been made to use its seven percent of world arable land to feed its twenty-two percent of world population. The introduction of the Household Responsibility System in 1978 by no means resulted in completely free planting choices for farmers. On the contrary, government interventions still exist. This is particularly true in the provinces plagued with grain shortage. This situation may be more aggravated by the fact that the central government initiated the provincial grain self-sufficiency policy in 1995 in an effort to balance grain supply and demand.

With respect to trade, even though at the provincial level, especially in some coastal provinces, agricultural exports have been embodied into their economic development strategy, it has never been one of the main objectives at the national level. Agricultural trade has long been used as a tool to stabilize the domestic market, that is, to import when shortage occurs, and to export when there is surplus. However, with the gradual transition from a central-planning to a market-driven economy, agricultural trade will become an integrated component of the market mechanism. This will be especially true, if Mainland China joins the World Trade Organization (WTO), for which Mainland China is now actively applying. If Mainland China joins the WTO without specific clauses for agricultural protection, it is

doubtful that it can still maintain its goal of self-sufficiency. Many government intervention practices such as import quotas, price supports, import tariffs will not be allowed, or restricted at least. In order to understand further the correlation among various factors such as policies, production, consumption, and trade, a systematic forecasting model-CPPA, developed by Economic Research Services (ERS) of USDA, will be used in the later part of the study.

2.1.6 Historical Trends of Agricultural Trade

As shown in Table 4 and Figure 7, grain exports have increased rapidly from 1.15 million tons in 1983 to 13.36 million tons in 1993. The surging export of grains in the early 1990s was mainly contributed by an increase in corn exports. Corn exports made up more than half of the total grain export. This was especially true during recent years. In 1992 and 1993, corn accounted for 85 and 82 percent, respectively, of total grain export volume. However, corn exports decreased sharply in 1994 as a result of a government ban due to the tremendous pressure from the animal husbandry industry in southern provinces. It is difficult to foresee that any large corn exports will be resumed in the future. On the contrary, Mainland China is expected to import a lot of coarse grains including corn in the future.

The other important item in grain exports is milled rice. Its export remained about 1 million tons during the mid 1980s, slid to 0.24 million tons in 1989, climbed back to 0.95 million and 1.53 million tons in 1992 and 1993 respectively, and dropped to about 0.25 million tons again in 1994 (Table 4). In terms of the export share in total production, even in 1993 when the largest volume of milled rice was exported, the export volume only accounted for less than one percent of total production. In contrast, corn exports accounted for more than 10 percent of production in 1993. Generally speaking, Chinese grain exports fluctuated greatly during this reform period. Export volume was to a large extent affected by domestic production and demand situation.

For meat products, export volume has experienced some cyclic movement during the past 10 years. The export volume of fresh and frozen pork remained about 0.1 million tons in early and mid 1980s, but it dropped to 0.063 millions tons in 1988, and then increased to 0.116 million tons in 1991. However, pork exports decreased again in 1992. The export

of beef has increased rapidly from 16 thousand tons in 1983 to 132 thousand tons in 1991, and then it dropped sharply to 17 thousand tons in 1993. The export of live poultry has increased slowly but steadily with an average growth rate of 8.92 percent per year. The exports of live swine and eggs have both decreased during 1983-1993. For other products, the export of fruits increased form 0.19 million tons in 1983 to 0.49 million tons in 1993 with an average growth rate of 9.6 percent per year. The export volume of sugar surged in 1992 and 1993 with its export volume to be about 1.6 million tons.

On the import side, food grain has experienced a cyclic trend. After some fluctuations, total grain imports declined from 16.28 million tons in 1987 to 7.34 million tons in 1993. However, in 1994, it increased to 17.9 million tons due to the unprecedented increase in corn imports of about 4.3 million tons, and the resumed normal import volume of wheat with more than 10 million tons. This situation reflects the increasing pressure on grain market in Mainland China. Taking 1994 as an example, even though Mainland China imported almost the largest volume of grain in history, the imported grain still only accounted for about 5 percent of total domestic production or consumption. That is to say, Mainland China has successfully maintained a grain self-sufficiency ratio of above 95 percent in recent years. Nevertheless, there are many apparent reasons to doubt that Mainland China can maintain this high ratio in the future.

Mainland China also imported large amounts of edible oil and fertilizer. The total import volume of edible oil decreased rapidly in the early 1990s. After reaching its climax points in 1991 and 1992 with about 18 million tons, imports of fertilizer also declined in 1993, but remained above 10 million tons.

In all, the Chinese agriculture has experienced stagnation during the recent ten years. The declining trends of arable areas and sown area for major crops, ever increasing population, and transformation of food consumption behavior will place more pressure on grain production. However, the production of cash crops as well as meats has increased rapidly during this period to keep pace with the changing food consumption behavior. Agricultural trade fluctuated greatly during the same time period. Statistical data show that it is unlikely China will expand grain exports very much in the future.

Table 4
Major Agricultural Exports in Quantity, 1983-1995

	live swine	live poultry	beef	pork	frozen broiler	eggs	food grains	milled rice	corn	soybeans
year	1,000 head	1,000 head	tons	tons	tons	millions	1,000 tons	1,000 tons	1,000 tons	1,000 tons
1983	3210	20680	16000	97538	35245	1034	1150	580	0	350
1984	3080	24000	14634	99597	27378	1094	3190	1160	890	840
1985	2960	34520	31652	111060	12570	1018	9330	1000	6340	1150
1986	3110	42450	25704	104670	27971	1063	9420	950	5640	1380
1987	3020	41150	33587	99964	16769	1109	7080	1020	3920	1490
1988	3030	44190	53985	63485	25660	923	7180	710	3920	1490
1989	2980	44840	56493	88423	31465	606	6570	240	3500	1260
1990	2990	47830	96593	124236	37814	601	5830	330	3410	940
1991	2850	47520	132040	116635	45395	604	10870	690	7790	1110
1992	2890	52830	26471	48188	78409	635	12010	950	10310	660
1993	2680	50710	17253	71222	82864	449	13360	1530	10950	530
1994	2700	52300	20000	100000	164288	486	13460	1520	1500	830
1995	2530	52630	20000	150000	248573	358	2140	50	0	380

	fruits	oranges	apples	sugar	tea	pork (canned)	beer	cotton	oilseeds	vege. Oil	cotton yarn
year	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons
1983	196037	12321	56278	60379	125062	73401	26396	0	361149	155658	114539
1984	174225	35599	44013	52167	145272	86961	26780	188867	336397	130766	167420
1985	214113	52308	55189	184026	136787	98589	28019	347027	309604	161618	154728
1986	223859	61239	48135	265475	172084	88664	28367	563157	508319	165723	228202
1987	243762	76160	60345	452493	174273	93757	32429	754577	528938	55660	242964
1988	280821	74705	87857	247801	198290	81529	39343	468002	510214	25503	205626
1989	262006	70514	70332	429623	198399	86341	41753	272482	392080	62099	183656
1990	226298	65624	62424	570494	195472	90906	35223	167283	515523	139477	176756
1991	163563	43413	24083	343315	184872	128409	43634	199980	572231	99334	186966
1992	280000	61374	38316	1670018	175885	53075	57140	144620	1280000	67846	162989
1993	490000	110126	130688	1638496	195091	73063	86478	156879	1260000	152940	154745
1994	392021	127428	107170	950000	179667	746190	a	108147	660000	270267	194927
1995	397984	131798	108946	480000	166572	847542	a	21619	530000	595970	179895

[a] Data are not available

Sources: 1.General Administration of Customs of People's Republic of China, *China Customs Statistics*, monthly issue (1983-1993).
2.State Statistical Bureau, *Statistical Yearbook of China*, 1996.

Table 5 Import Quantity of Major Agricultural Products, 1983-1995

Import items / year	food grain 1,000 tons	wheat 1,000 tons	corn 1,000 tons	sugar 1,000 tons	cotton tons	wool tons	fertilizer tons	edible oil tons
1983	13520	11200	2110	1834.061	230155	110385	7995310	35029
1984	10410	9870	50	1230.694	39774	55751	9217259	14261
1985	5970	5370	90	1908.721	163	113375	7609396	34777
1986	7720	6120	590	1182.491	187	152205	5282933	197980
1987	16280	13200	1540	1826.814	5976	152503	10918393	521428
1988	15330	14540	110	3708.938	34774	187346	14706325	213721
1989	16580	14880	70	1580.635	519039	104388	13933013	1056156
1990	13720	12530	370	1132.122	416734	33329	16275945	1122833
1991	13460	12360	0	1013.763	370523	106243	18175188	611887
1992	11620	10590	0	1090.000	270000	79457	18580000	420000
1993	7340	6430	0	440.000	0	237459	10200000	220000
1994	9200	7300	618	1550	500000	319263	12660000	1630000
1995	20810	11590	5181023	2950	740000	283668	19910000	2130000

Sources: 1.General Administration of Customs of People's Republic of China, *China Customs Statistics*, monthly issue (1983-1993).
2. Data for 1994 come from official USDA production, supply, and distribution database.

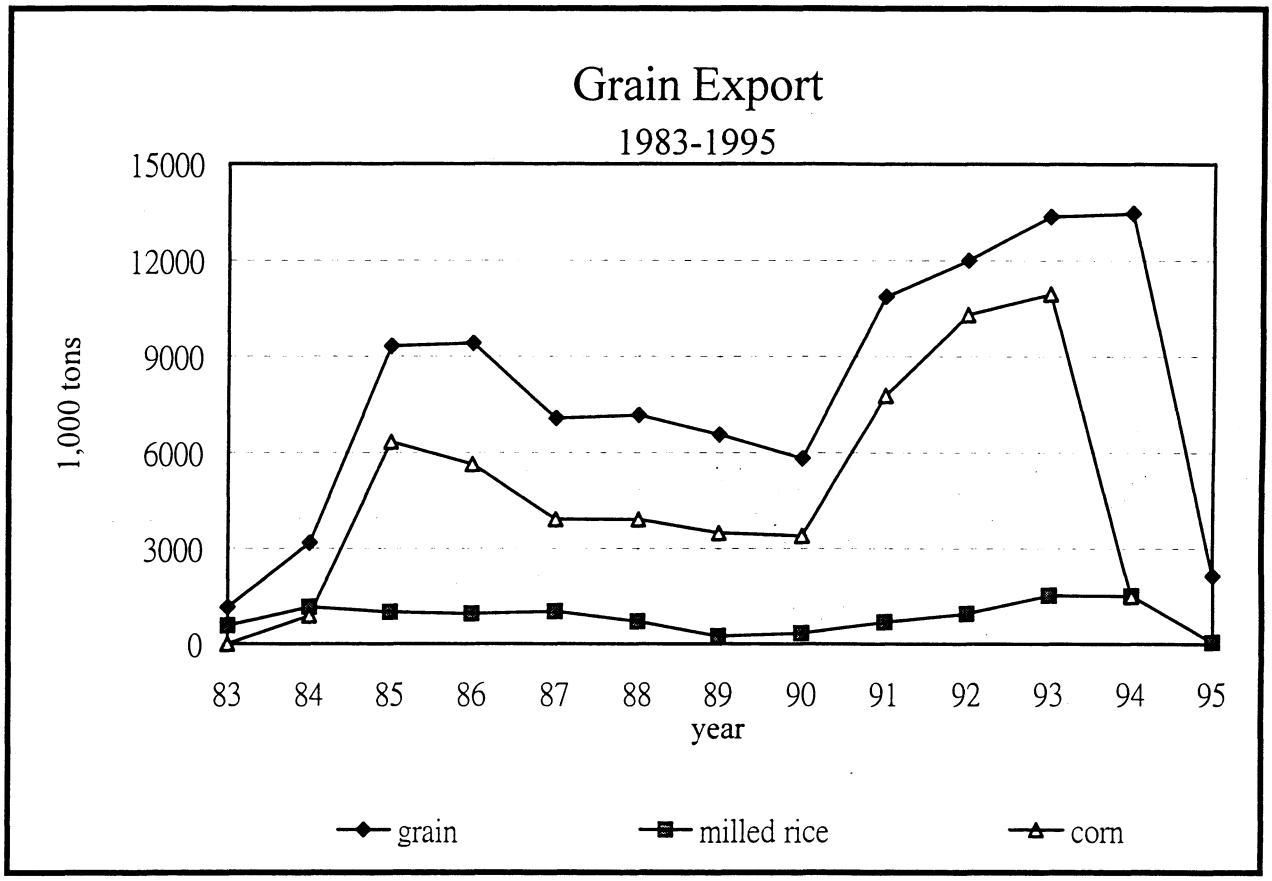

Figure 7. Grain Export, 1983-1995.

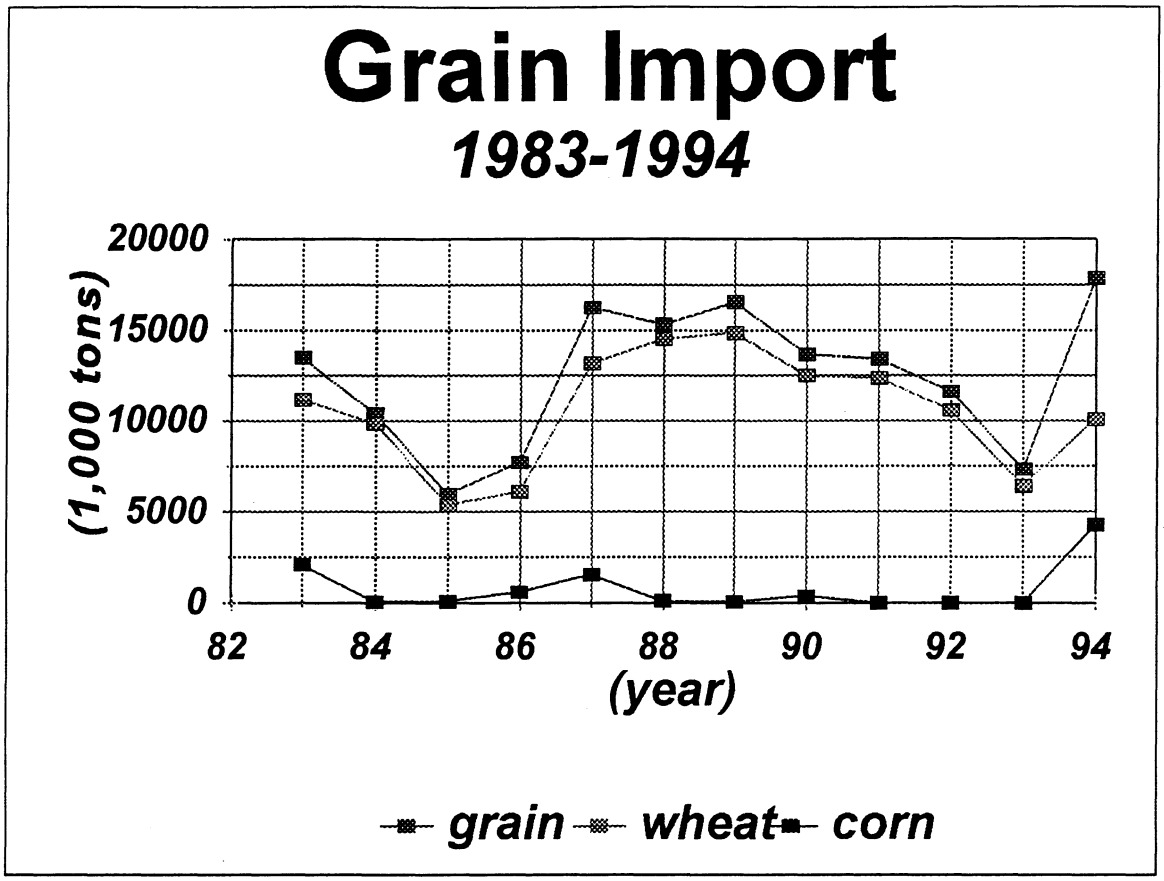

Figure 8. Grain Import,1983-1994.

2.2 Food Consumption Behavior by Urban Chinese

2.2.1 Historical Review

The Chinese economy has increased rapidly since 1978. Specifically, gross domestic product (GDP) increased from 358,810 million Yuan in 1978 to 3,138,030 million Yuan (or US$ 545,744 million) in 1993 (State Statistical Bureau, 1994). In real terms, the size of Chinese economy has already quadrupled from 1978 to 1995 with an amazing average growth speed of 9%. However, Mainland China's GDP was only 8.77% of that in the United States in 1993 (The U.S. GDP in 1993 was 6,219,655 million U.S. dollar), it is widely believed that GDP in Mainland China has been significantly underestimated. Some estimates even indicate that the Mainland China's GDP has already exceeded half of that in the United States. If this high speed of development is sustained or does not reduce too much, it is not difficult to foresee that it will not take too long before the Chinese economy becomes the largest in the world.

Benefiting from the dramatic development in the economy, per capita income has also increased rapidly. Annual per capita income increased from 685 Yuan in 1985 to 3179.15 Yuan in 1993, representing an average growth rate of 18.60 percent per annum. Parallel to the increases in income, the living expenditure of urban households has also experienced rapid increases with an average annual growth rate of 17.40 percent during 1985-1993.

Table 6
GDP, Annual Per Capita Income, Living Expenditure, and Food Expenditure, 1985-1995

Year	GDP (100 million Yuan)	Living Income (Yuan)	Living Expenditure (Yuan)	Overall CPI[a] (preceeding year = 100)	Food (Yuan)	Expenditure Share of Food (%)
1985	8,527.4	685	673.20	108.8	351.72	52.25
1986	9687.6	827.88	798.96	106.0	418.92	52.43
1987	11307.1	915.96	884.40	107.3	472.93	53.47
1988	14074.2	1119.36	1103.98	118.5	567.01	51.36
1989	15997.6	1260.67	1210.95	117.8	659.96	54.50
1990	17681.3	1387	1278.89	102.1	693.77	54.25
1991	20188.3	1544	1453.81	102.9	782.50	53.82
1992	24362.9	1826	1671.73	105.4	884.82	52.93
1993	31380.3	2337	2110.81	113.2	1052.20	50.15
1994	46622.0	3179.15	2851.34	121.7	1422.49	49.89
1995	58261.0	3892.94	3537.57	114.8	1766.02	49.91
Average annual growth rate (1985-1995) (%):	21.19	18.98	18.05		17.51	

[a]Based on overall retail price index for commodities.

Source: State Statistical Bureau, *Statistic Yearbook of China, 1994-1995.*

2.2.2 Engel Coefficient

As expected, when income increases, the Engel coefficient (the percentage of food expenditure in total expenditure) declines. However, in the 1980s, the Engel coefficients fluctuated. From 1985 to 1987, the Engel coefficients actually increased slightly. In 1988, the Engel coefficient decreased notably, despite the fact that the inflation rate was as high as 18.5 percent. In 1989, the Engel coefficient jumped to 54.5. Since then, it has declined steadily to 49.89 percent in 1994, even though the food prices index in 1992-1994 increased more than 20 percent each year. These figures indicate that as the market economy develops, the food consumption behavior of Chinese consumers also complies with the Engel Law. The decreasing Engel coefficient reflects the improving living standard of households. The year 1994 was the first year when the Engel coefficient in Mainland China was below 50 percent.

2.2.3 Expenditure Shares of Major Food Items

From Tables 7 and 8, we can see that the total expenditure on food has tripled from 1987 to 1994 with an average growth rate of 17 percent. Expenditures on such food items as grain, pork, beef , fish, eggs, milk, and vegetables in 1994 were three times as much as in 1987.

Within grain products, expenditures on rice and flour rose rapidly in the early 1990s. They showed the average growth rates of 24.6 and 23.3 percent, respectively, during 1987-1994, much higher than the growth rate of total grain expenditure, which was only 17.1 percent. In combination with the fact that grain consumption has declined steadily during the past decade, these data show that the price of grain, especially for rice and flour has increased rapidly. The surge of expenditure in the early 1990s may be attributed to the elimination of the food rationing in 1993 and the production decrease during these years. It also shows that grain will still account for an important proportion of total food expenditure or living expenditure. Its expenditure share increased to 7.08 in 1994 after two consecutive drops in 1992 and 1993.

The expenditure on all meats group (including pork, beef, mutton, poultry, fish, egg, and fresh milk) accounted for more than 15 percent of total living expenditure, and more than

30 percent of total food expenditure during this period[1]. The meat expenditures increased at a rate of 17.3 percent during this time period. After reaching its highest point in 1989, the share of meat expenditure kept on decreasing from 18.53 in 1989 to 15.22 in 1994. Within the meat group, the importance of pork has been declining, while expenditure on poultry increased rapidly with the annual growth rate of 27.4 percent. Expenditure on poultry in 1994 was 5 times more than that in 1987, and its share in the total living expenditure share also increased from 1.77 percent in 1987 to 2.39 in 1994. The expenditure shares of beef and mutton decreased steadily during this period. The expenditure shares of fish, egg, and fresh milk fluctuated slightly and did not change much.

With respect to other food items, we observe that expenditure shares of most food items except vegetable oil have displayed a declining trend during 1992-1994. Vegetables still accounted for about 10% of total food expenditure and for more than 5 percent of total living expenditure.

[1]This figure may underestimate the total meat expenditure, because it does not include meats consumed away from home, and it also does not include other meats items and other dairy products except the fresh milk.

Table 7
Expenditures of Major Food Items of Urban Chinese Households, 1987-1995

(unit: Yuan)

Item	1987	1988	1989	1990	1991	1992	1993	1994	1995
Food	472.93	567.01	659.96	693.77	782.50	884.82	1058.20	1422.49	1766.02
Grain	66.92	75.66	81.88	84.50	102.53	104.42	129.96	201.97	260.53
Rice	23.78	26.91	30.44	29.20	36.02	47.20	66.35	110.98	157.82
Flour	14.39	17.48	17.69	17.05	22.12	39.83	42.75	62.18	60.22
Meat [a]	142.14	188.52	224.41	232.65	242.61	272.58	324.72	434.01	502.23
Pork	65.27	86.16	105.04	106.93	106.39	103.48	120.28	167.69	214.73
Beef	b	b	b	b	b	14.17	16.14	20.49	22.03
Mutton	b	b	b	b	b	9.44	11.28	13.65	15.23
Beef & Mutton	12.55	15.53	18.39	21.23	21.51	23.61	27.42	34.12	37.26
Poultry	12.55	15.53	18.39	21.23	21.51	23.61	27.42	68.29	82.13
Other Meats	c	c	c	c	c	21.15	26.45	30.55	33.05
Fish	24.30	31.20	38.21	38.49	40.88	42.43	50.30	68.66	82.13
Egg	20.65	27.96	32.42	34.77	35.93	40.31	47.07	57.92	69.58
Milk	3.72	3.87	4.36	5.34	6.05	7.21	8.29	10.19	12.35
Vegetable	57.94	78.47	89.32	88.78	95.81	95.95	113.64	147.40	184.17
Vegetable Oil	13.84	17.98	19.31	28.68	25.15	29.39	37.49	62.22	67.62
Sugar	3.71	5.29	6.12	5.60	5.16	4.58	5.42	7.48	9.59
Spirit & beer	21.18	23.78	26.51	28.39	31.46	31.11	34.77	43.62	51.46
Cigarette	26.11	30.68	37.75	42.93	48.00	54.06	61.68	70.75	76.68
Fruits & Melons	40.09	44.02	53.93	56.90	61.92	61.44	69.11	89.20	112.10

[a] Meats includes pork ,beef, mutton, poultry, fish ,egg, and fresh milk.
[b] Separate data for beef and mutton were not available.
[c] Data were not available for 1987-1991.
Source: State Statistical Bureau, *Chinese Urban Household Survey*, 1987-1995.

Table 8
Expenditure Shares of Major Food Items in Urban Chinese Households, 1987-1995

(unit: percent)

Item	1987	1988	1989	1990	1991	1992	1993	1994	1995
Expenditure share(%):									
food	53.47	51.36	54.50	54.25	53.82	52.93	50.15	49.89	49.91
grain	7.57	6.85	6.76	6.61	7.05	6.24	6.15	7.08	7.36
Rice	2.69	2.44	2.51	2.28	2.48	2.82	3.14	3.89	4.46
Flour	1.63	1.58	1.46	1.33	1.52	2.38	2.03	2.18	1.70
meats [a]	16.07	17.07	18.53	18.19	16.69	16.31	15.38	15.22	14.19
pork	7.38	7.80	8.67	8.36	7.32	6.19	5.70	5.88	6.07
beef & mutton	1.42	1.41	1.52	1.66	1.48	1.41	1.31	1.20	1.05
poultry	1.77	2.16	2.15	2.02	2.19	2.31	2.37	2.39	2.32
fish	2.33	2.53	2.68	2.72	2.47	2.41	2.23	2.03	2.44
egg	2.75	2.87	3.16	3.01	2.81	3.55	3.38	3.36	1.97
fresh milk	0.42	0.35	0.36	0.42	0.42	0.43	0.39	0.36	0.35
vegetable oil	1.56	1.63	1.59	1.60	1.73	1.76	1.78	2.18	1.91
Vegetable	6.55	7.11	7.38	6.94	6.59	5.74	5.38	5.17	5.20
Sugar	0.42	0.48	0.51	0.44	0.35	0.27	0.26	0.26	0.27
Spirit & beer	2.39	2.15	2.19	2.22	2.16	1.86	1.64	1.53	1.45
Cigarette	2.95	2.78	3.12	3.36	3.30	3.23	2.92	2.48	2.17
Fruits & Melons	4.53	3.99	4.45	4.45	4.26	3.68	3.27	3.13	3.17

[a] Meats includes pork ,beef, mutton, poultry, fish ,egg, and fresh milk.
Source: State Statistical Bureau, *Chinese Urban Household Survey*, 1987-1995.

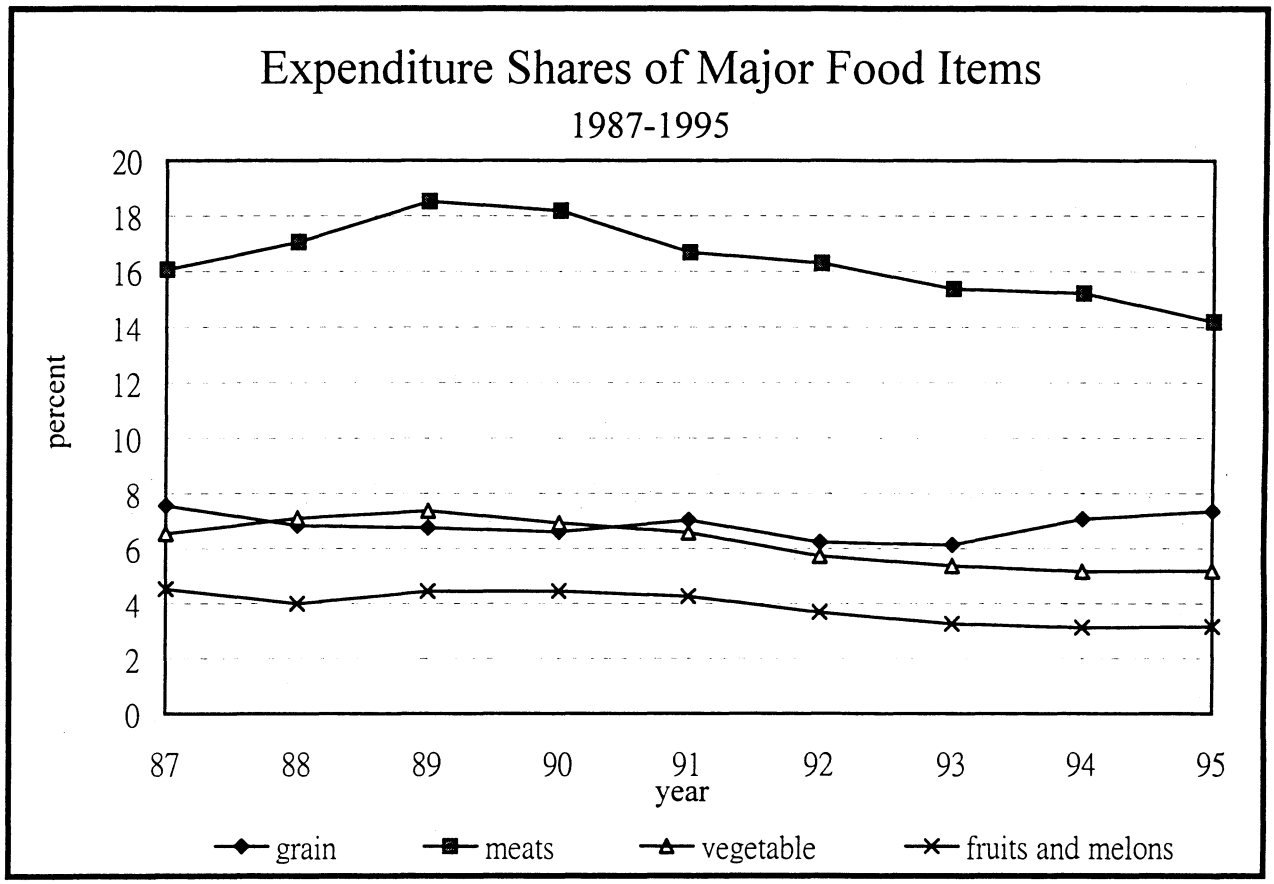

Figure 9. Expenditure Shares of Major Food Items, 1987-1995.

Table 9 shows several interesting patterns of change in food consumption in terms of quantity by Chinese urban residents. Grain consumption declined notably from 134.76 kg in 1985 to 97.78 kg in 1993 with an average rate of decline of 3.9 percent, and then it rose slightly in 1994. However, as we have pointed out, the expenditure share of grain did not decrease very much during this time period, and it actually increased during 1992-1994. The sharp increase in grain prices and consumption of higher quality grain products are attributable to this phenomenon. The consumption of rice decreased steadily from 62.73 kg in 1985 to 54.27 kg in 1994, while consumption of flour rose rapidly until 1992 and then, dropped back to 34.07 kg in 1994.

In quantity, the consumption of meat group rose during this period. The consumption of pork, beef, and mutton increased in the 1980s but decreased in early 1990s, which may be caused by price increases in recent years. These trends may imply that the consumption of these meat products was responsive to price changes. Of course, this assumption has to be proved through econometric modeling later. In contrast, poultry and egg consumption has increased steadily during 1985-1994. Consumption of fresh vegetables, sugar, and cigarettes also declined during this period at a rate of 2.0, 3.0, and 4.0 percent per annum, respectively. Consumption of fruits and melons, and spirits remained steady. Urban consumers were also found to consume more vegetable oil during this same period.

In summary, as indicated by the Engel coefficients, the living standard of Chinese households has improved during the reform period. Chinese urban consumers consumed less grain products, vegetables, and cigarettes, more poultry, eggs , and vegetable oil. However, in terms of expenditures and expenditure shares, grain still accounted for a significant proportion of the total food as well as living expenditure due to surging grain prices. The expenditure share of meats has been declining since 1989. Among meat products, only expenditure shares for poultry and eggs had an increasing trend during 1987-1994. Econometric modeling in the later part of the thesis will help us further understand the consumption behavior of urban consumers.

Table 9
Per Capita Consumption of Major Food Items in Urban Chinese Households 1985-1995

(unit: kg)

Item	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Grain	134.76	137.88	133.87	137.17	133.94	130.72	127.93	111.50	97.78	101.67	97.00
Rice	b		62.73	60.44	59.08	56.72	56.69	54.09	52.64	54.27	59.20
Flour			33.70	40.11	39.81	38.56	38.81	43.19	32.47	34.07	35.24
Meat group			41.99	41.81	42.81	44.73	47.56	49.65	48.72	49.86	42.11
Pork	16.68	18.96	17.78	16.94	17.53	18.46	18.86	17.70	17.40	17.12	17.24
Beef & Mutton	2.64	2.64	2.91	2.81	2.73	3.28	3.34	3.71	3.36	3.10	2.44
Poultry	3.24	3.72	3.40	4.00	3.65	3.42	4.40	5.08	5.20	5.67	3.97
Eggs	6.84	7.08	6.56	6.87	7.05	7.25	8.26	9.45	9.36	10.17	9.74
Fish	7.08	8.16[a]	7.40	7.07	7.61	7.69	8.02	7.59	7.43	8.16	4.10
Fresh Milk			4.53	4.12	4.24	4.63	4.68	5.52	5.38	5.25	4.62
Fresh Vegetable	144.36	137.88	134.51	147.02	144.56	138.70	132.18	124.91	120.64	120.74	116.47
Sugar	2.52	2.64	2.39	2.58	2.38	2.14	1.80	1.85	1.77	1.91	1.68
Cigarette[c]			40.68	36.86	34.24	35.12	34.69	33.03	32.23	30.53	28.58
Vege. Oil			6.09	6.96	6.16	6.40	6.93	6.65	7.14	7.52	7.11
Fruit & Melon			43.23	39.73	41.73	44.32	44.70	47.78	44.55	45.53	35.41
Spirit & Beer			9.92	9.44	9.00	9.25	9.45	9.67	9.55	9.88	9.93

[a] Include both fish and shrimp
[b] Blank indicates data not available
[c] In terms of packs.

sources: 1. State Statistical Bureau, *Statistical Yearbook of China*, 1994-1996.
2. State Statistical Bureau, *Chinese Urban Household Survey*, conducted by urban social and economic investigation team of State Statistical Bureau. (unpublished)

CHAPTER III

REVIEW OF LITERATURE

This chapter reviews and summarizes the literature concerning food consumption behavior and Agricultural production and trade potential in Mainland China.

3.1 Literature Review on Food Consumption Behavior

As Mainland China's rural population still accounts for more than 70 percent of the total, despite the undergoing urbanization, the importance of understanding the consumption behavior of rural residents is obvious. Several recent papers have addressed this issue.

Lewis and Andrews(1989) conducted their research with data from 1982 to 1985. Using the Linear Expenditure System (LES), they projected the decreasing trend of expenditure on food and staple foods and the increasing trend in the demand for meat, fish, and poultry. Fan ,Cramer, and Wailes(1994) updated and expanded the research on the food consumption behavior of rural households by analyzing rural consumption behavior during 1982-1990, using a dynamic AIDS model. They concluded that all important food commodities have positive expenditure elasticities. They further showed that the expenditure elasticities for rice, coarse grains and tobacco are declining, while those for wheat, meat, vegetables and alcohol are increasing. In another similar study, Fan, et al., also used a two-stage LES-AIDS model to estimate the price and expenditure elasticities for various commodity groups. They demonstrated that the demand for commodity groups such as food, clothing, fuel, housing, and other commodities is price inelastic, and housing and other commodities are luxury goods, while clothing and food are necessities.

Halbrendt, Tuan, Gempesaw, and Dolk-Etz(1994) used the rural household survey data in 1990 to estimate an AIDS model. The model was expanded to include some socio-demographic variables such as geographical location, topography, household type, etc. which were all found to be statistically significant, implying the strong impacts of socio-demographic factors on food consumption behavior in Mainland China. Their study indicates

that 1) own-price elasticities of most food items are inelastic, 2) little commodity substitution exists except for grain, 3)meats, poultry, fruits, and sweets are most responsive to expenditure fluctuation.

However, cautions should be exercised when econometric models based on neoclassical economic theory are used to to analyze rural consumers' behavior in Mainland China. Specifically, many non-market factors are still prevalent, even though their impacts are diminishing. The limitation in market accessability, a high self-subsistence ratio (about 60%), and a high level of housing construction (after such a long time of repression in very poor living conditions), and even the backward ideology in rural areas can cause distortion of their consumption behavior. The results from the usual econometric method will certainly be biased, if there are no adjustments. Actually, Halbrendt et al. have already realized this problem in their article by pointing out that " the poultry and "other food" consumption was not consistent with the theoretical cost minimization behavior". Their explanation was that "socio-cultural factors, rather than the economic considerations may be the predominant factors in consumers decisions".

After concluding that rice, especially high quality rice (japonica) still being a normal good in rural Mainland China, Huang and Rozelle(1994) also raised the problem of market imperfection when analyzing the consumption behavior in rural Mainland China. In their three-stage estimation of rural consumption in Zhejiang province, they found that the production level from the households own fields has a strong effect on the consumption behavior of rural households. High transaction costs and transport constraints will also add more distortion to their consumption. Thus, they pointed out that the compensated own-price elasticities for rice and meat, and expenditure elasticities on meat, tend to be underestimated due to low accessability to the market.

In order to further justify their above proposition, Huang and Rozelle (1995) in another study incorporated a variable measuring the degree of market accessability in their estimation of rural food demand behavior in Hebei province for 1978-1992. These results showed that the degree of market accessability not only affects the average expenditure shares of different food items, it also affects the marginal expenditure shares. In the case of

no marketing constraint, the expenditure elasticities of products produced from rural households' own yard such as grain and vegetables were overestimated, while those of products purchased from the market were underestimated.

Huang and Rozelle's studies have shed some light on the importance of understanding the impacts of marketing structure on rural consumer behavior in Mainland China. However, their studies were mostly restricted to specific provinces. Given the remarkable differences in the socio-demographic conditions, income, and market development status in Mainland China, it will be difficult to use their results and estimates at the national level.

On the other hand, the consumption behavior of urban households is much less distorted, especially after recent elimination of the rationing system in 1993. Food rationing had been in effect since the founding of the People's Republic of Mainland China in 1949, and had been the dominant distorting force in urban food consumption until 1993. Among the food commodities, grain and oil were once strictly rationed due to the limitation of production. The rationing of other products such as meats were more localized, and varied among different regions.

Wang and Chern (1992) were among the first to formally use an econometric model to analyze the effects of rationing in Mainland China. The Almost Ideal Complete Demand System(AIDS) model was extended to incorporate the effects of rationing. With data from 1981-1987, they showed that rationing has distorted consumption behavior in urban Mainland China, and resulted in over consumption of durables and unrationed food such as nonstaple food. These extra demands generated great pressure on the food supply in Mainland China.

These findings were later confirmed by the another research by Chern and Wang (1994), in which both a linear expenditure system and quadratic expenditure system were used to analyze urban Chinese consumption behavior using provincial data from 1985 to 1990. Twenty-three food items were grouped differently to investigate the impacts of food rationing. Their study found that the urban consumer would spend about 42 percent of additional income on food, and more would be spent on meat products and less on grain and oil.

Wu, Li and Samuel (1995) also examined consumption patterns in urban households in Mainland China with the cross-section data for 1990. They applied a two-stage AIDS model, concluding that rice, pork, vegetables and eggs are more essential in the Chinese urban diet because of the low own price elasticities, while the demand for fruit and fish are more price elastic. Their paper supports the proposition of the potential for the emergence of a large Chinese market for non-staple foods.

Wang et al. (1994) compared the LA/AIDS (Linear Approximate) with a translog model in studying food demand in urban Mainland China. Their results showed that these two demand systems were not significantly different in their explanatory power of Chinese consumption data. With the data for 1986-1991, they also showed that the demand for animal products was affected by the own and cross prices as well as demographic variables such as household size. They further indicated that increasing demand for animal products would be sustained while the increase in demand for red meats tended to be slower than that for demand for other animal products like poultry and fish.

3.2 Literature Review on Production and Trade Potential in Mainland China

As this thesis will mostly concentrate on the demand side of the Chinese agricultural market, the review of the literature on production and trade will be used mostly for a comparison between our predictions and those already available in the literature. Therefore, a very detailed review of studies on the supply and production sides are not conducted in this section. We focus more on the different projections of production and trade than on the estimation of supply elasticities.

The prediction made by Lester R. Brown is certainly one of the most controversial ones in the literature. His article, "Who Will Feed Mainland China?" not only shocked decision-makers in Mainland China, but also aroused heated debates among scholars who were interested in Chinese agriculture. Brown showed that Chinese food supply will be under great pressure, and finally Mainland China will be a giant grain importer by 2030. The pressure comes from the absolute increase in population by 14 million per annum, and surging income at a record speed, dramatic consumption behavior transformation which leads to more consumption of meat products, and shrinkage of crop land. Compared with the

historic trends observed in Japan, South Korea, and Taiwan, Brown predicted that by 2030, with a 20 percent decrease in total grain production, Mainland China has to import grain of 305 million tons a year, accounting for about 56% of total grain domestic production. He even suggested that Mainland China's food scarcity will become the world's scarcity.

Deeply worried by the warning of Dr. Brown's article, the State Council of Mainland China designated the Chinese Academy of Sciences to establish an expert panel to study food security in the near future. The panel produced a report, entitled, "Mainland China's Agricultural Production: Problems, Prospects, and Strategies". The study pointed out that the slow increase in the yield for major crops from 1984 to 1993, and rapid decline of both arable land and sown areas are the two main reasons for the grain stagnation in this period. It further indicated that food security can be achieved if the country follows the strategies of maintaining the sown area, increasing the production of fertilizer such as phosphates and potash, upgrading the irrigation system and expanding the irrigated cropland, improving the grain breeding, and increasing investment in technology, extension, and farming skill.

Huang, Rozelle, and Rosegrant(1995) also addressed the grain issue. They pointed out that grain directly consumed, reached its climax in the 1980s-1990s. Rural consumers will have a very limited tendency to increase direct grain consumption up to 2000. In fact, direct grain consumption will definitely decline in the first decade of 2000. At the same time, they projected that high urbanization will contribute to the decreases in per capita grain consumption from 225 in 1990, to 223 kg in 2000, to 214 kg in 2010, to 203 kg in 2020. In sharp contrast, meat demand will increase 2.5 fold by 2020, which will result in an increase in the proportion of feed in total grain consumption from 20 percent in 1990 to 40 percent in 2000. Total grain demand will be about 450 million tons (refined). However, total grain production can only reach 410 million tons (refined). As a result, they predicted that grain imports would reach 40 million tons, three times as much as the largest level of imports in recent history, and 43 million tons by 2020 tons, with a self-sufficiency rate of 92 percent. Huang et al. claimed that the gap between demand and supply will not exceed 40-50 million tons by the year 2000, and Mainland China will not exhaust all the surplus of grain market in

the world. However, Mainland China is likely to import more grain in next 10 years, but will not be a large grain exporter in the international market.

Xi-Ji An (1995) specified different scenarios to estimate grain demand and potential trade deficits to the year 2010. Based on data from 1980-1992, he estimated the demand for food grain, animal products as well as feed grain by rural and urban residents separately. Two rates of urban population growth were used as the starting points for scenario projection. Double-log functions were used to derive the various elasticities for food grain and animal products. After estimating the ratios of animal products to feed grain, An projected the demand for grain (including food grain, feed grain, grain for seeds, feed grain for drought animal, grain for distilling spirit, and grain damage and manufacture use) to be about 540, 613, and 726 million tons in 2000,2005, 2100 respectively with a 3.5 percent urban population growth rate, while it would reach 523, 602, 708 million tons with a 4.5 percent of growth rate. An also pointed out the impacts of non-market forces such as rationing, government subsidies, and expectation of future income on people's consumption behavior. Use of high yielding of varieties of major cereals and farmers' skill, as well as agricultural policies, were identified as keys for efficient agriculture. With the assumed growth rates of grain output at 1.8, 2.1, and 2.4 percent, it is estimated that Mainland China will have a grain deficit of 113, 80, and 45 million tons by the years 2000, 2005, and 2010 respectively in scenario I (urban population growth rate of 3.5 percent), and of 95, 62, and 27 million tons respectively in scenario II (urban population growth rate of 4.5 percent). In his view, Mainland China would be a major grain importer in the future.

3.3 Expected Contributions From This Study

The first part of this thesis analyzes the food consumption behavior of urban Chinese households using data for 1985-1994 or 1992-1994. The study includes more food items than any previous study. Namely, eight food groups are studied in the first stage, and 8 food items in grain and meat subgroups respectively are covered in the second stage. (The detailed inclusion of food items will be available in the next chapter.). The thesis presents different model specifications in terms of time period and region coverage to uncover the potential regional effects and structural changes over time. The thesis will give the latest insight into

Chinese urban food consumption behavior after the elimination of food rationing policy in 1993.

The lack of a systematic simulation tool and the absence of complete and robust elasticities are two major obstacles in the projection of Chinese agriculture. The second part of the thesis attempts to overcome some of these difficulties by using the CPPA model developed by ERS of USDA, incorporating newly estimated demand elasticities in this thesis. Findings from previous studies suggest that agricultural productivity, i.e., the yield growth rates of major crops, will be the key factor for further increase in Chinese agricultural production in the future. Therefore, several scenarios are established based on different expected yield growth rates of major crops. In the mean time, given the impact of the urbanization movement on the food consumption, projections are also conducted based on the different urbanization rates in the future.

CHAPTER IV

THEORETICAL FRAMEWORK AND EMPIRICAL DEMAND MODELS FOR URBAN CHINESE RESIDENTS

Standard approaches in the empirical modeling of consumer behavior in a market economy assume that the consumer always searches for the maximum utility subject to his or her budget constraint. Quantity demanded, or expenditure spent on the commodities is often considered to be the dependent variable in the demand function, which is affected by prices and disposable income as independent variables. The utility maximization problem can be simply specified as follows:

$$\begin{aligned} &Max\ U(x) \\ &s.t.\ PX \le I \end{aligned} \tag{4.1}$$

where ***U(.)*** is the utility function reflecting the consumer's preferences, ***X*** is the vector of goods consumed, ***P*** is the price vector corresponding to the commodity set, and ***I*** is the consumer's disposable income or total expenditure. The solution to this maximization problem gives the Marshallian demand equation which can be written explicitly as :

$$q_i = q_i(P_1, P_2, \cdots, P_n, I) \tag{4.2}$$

The almost ideal demand system (AIDS) is a popular framework for estimating price and income elasticities when expenditure or budget data are available. Deaton and Muellbauer (1980) proposed that the cost or expenditure function, which defines the minimum expenditure necessary to attain a specific utility level, can be used to represent consumer preferences, known as the PIGLOG class. With the selection of a specific functional form, the cost function in the AIDS model can be written as:

(4.3) $$\log c(u,p)=\alpha_0+\sum_k \alpha_k \log p_k+\frac{1}{2}\sum_k\sum_j \gamma_{ij}^{*}\ \log p_k \log p_j+u\beta_0\prod_k p_k^{\beta_k}$$

From the indirect AIDS cost or expenditure function, the expenditure share equation can be derived for each commodity or commodity group. Using Shepard lemma, its price derivatives are the quantities demanded. After some re-arrangement, we can obtain the basic specification of the AIDS model in budget share form which can be expressed as:

(4.4) $$w_i=\alpha_i+\sum_j \gamma_{ij}\log p_j+\beta_i \log\left(\frac{Y}{P}\right)$$

where w_i is the expenditure share of commodity I, $\mathbf{P_j}$ is commodity price , **Y** is the total expenditure of the selected goods, and **P** is an overall price index which is defined by:

(4.5) $$\log P=\alpha_0+\sum_k \alpha_k \log p_k+\frac{1}{2}\sum_j\sum_k \gamma_{kj}\log p_k \log P_j$$

When there is no change in relative prices and **Y/P,** the budget shares are constant. Changes in relative prices take effect through γ_{ij}; Changes in expenditure operate through the β_i coefficients; these are summed to zero and are positive for luxuries and negative for necessities (Deaton and Muellbauer, 1989).

For the simplicity in empirical estimation, the following Stone's price index (**P***) is often used instead of **P**:

(4.6) $$\log P^* = \sum_k w_k \log P_k$$

The model using the Stone's price index is often called the "linear approximate AIDS" (LA/AIDS). The following restrictions on parameters are imposed to be consistent with the demand theory.

(4.7) Adding-up:

$$\sum_{i=1}^{n} \alpha_i = 1$$

$$\sum_{i=1}^{n} \gamma_{ij} = 0$$

$$\sum_{i=1}^{n} \beta_i = 0$$

(4.8) Symmetry: $$\gamma_{ij} = \gamma_{ji}$$

(4.9) Homogeneity: $$\sum_j \gamma_{ij} = 0$$

The system of expenditure share equations can be estimated using Zellner's ITSUR (Iterative Seemingly Unrelated Regression)procedure with adding-up, homogeneity, and symmetry restrictions imposed.

Blanciforti and Green(1993) summarized the following advantages of the AIDS model: (1) it gives arbitrary first-order approximation to any demand system; (2) it satisfies the axioms of choice exactly; (3) it aggregates perfectly over consumers; (4) it has a functional form which is consistent with previous household-budget data; (5) it is simple to estimate in LA/AIDS form because it avoids non-linearity in the parameters; and (6) it can be used to test for homogeneity and symmetry.

Following Heien and Pompelli (1988), the basic AIDS model can also be extended by including socioeconomic and other demographic variables. It was originally intended that this thesis would include some socio-demographic variables such as household size into the demand system. However, incomplete data for these variables led to the idea being abandoned.

Green and Alston (1990) compared the several ways of computing own-price and cross-price elasticities in AIDS using the Stone's price index (LA/AIDS). They found that if preference are not homothetic, the results from different forms would be significantly different. They showed that the correct expenditure, own, and cross price elasticities should take the form of :

(4.10) Expenditure Elasticity: $$\eta_i = 1 + \frac{\beta_i}{\omega_i}$$

(4.11) Price Elasticity: $$\varepsilon_{ij} = -\delta_{ij} + \gamma_{ij}/w_i - \beta_i w_j/w_i - \frac{\beta}{w_i}\left(\sum_k w_k \log P_k(\eta_{kj} + \delta_{kj})\right)$$

where δ_{ij} is the Kronecker delta ($\delta_{ij} = 1$ for I=J; $\delta_{ij} = 0$ for I≠ J);

Their results also showed that following simplified forms (which treats shares as exogenous) also generate the very similar own-price and cross price elasticities:

(4.12) Own Price Elasticities: $$e_i = -1 + \frac{\gamma_{ii}}{w_i} - \beta_i$$

(4.13) Cross Price Elasticities: $$\varepsilon_{ij} = \frac{\gamma_{ij}}{w_i} - \frac{\beta_i w_j}{w_i}$$

In this study, we will use these two simplified forms to compute the price elasticities. A commodity is estimated to be inferior if $\eta_i < 0$; substitutes and complements can be determined by the sign of ϵ_{ij}, if $\epsilon_{ij} > 0$, the commodities I and j are gross substitutes; if $\epsilon_{ij} < 0$, then they are gross complements.

The adding-up restriction is satisfied automatically since the budget shares add up to 1 with the above model specification. The homogeneity and symmetry conditions can be imposed on the parameters of the demand system, and they can be tested statistically.

In this study, the model will be estimated with and without the theoretical restrictions. In the first stage, no restriction will be imposed. There are (N+2)(N-1) free parameters to be estimated. Because each equation has N+2 parameter in the AIDS specification, and there are N-1 equations to be estimated (one equation is dropped from the estimation). Then, when the homogeneity condition is imposed, it puts one restriction on each equation, and has a total of N-1 restrictions, leaving (N+1)(N-1) free parameters to be estimated. Finally, when the symmetry condition is imposed on the demand system, it will have (N-1)(N-2)/2 restrictions, which results in (N-1)(N+4)/2 free parameters. By comparing the results between the restricted model and unrestricted model, we can test the validity of demand system derived from the neoclassical theory of consumer behavior when using a particular data set.

CHAPTER V

DATA AND FOOD DEMAND ESTIMATION

5.1 Data and Expenditure Categories

Data from the Income and Expenditure Survey of Chinese Urban Households are used for this study. This survey has been conducted by the General Team for Urban Household Survey of State Statistical Bureau (SSB), Mainland China. The survey started in 1956, but was suspended during the period 1966-1979 and resumed in 1980 (He, 1985). Urban households are defined as those having family members working in the state and collective institutions. Sample households are selected using a three-stage stratified and systematic sampling technique. Cities are selected in the first stage, enterprise and institutions are selected in the second stage, and households are selected in the third stage. The households selected in the surveys were drawn from a very large population frame based on proportionate stratification, one out of ten thousand households. Although the sampling procedure may not strictly accord with the principles of random sampling, Chinese statisticians have asserted that the impact has not been significant. (Taylor and Hardee, 1986)

This study uses the survey data from 1985-1994. Comparing with previous studies, this study covers a much longer period after the adoption of reform policies. Thus, we can contribute to the literature with the latest knowledge about food consumption behavior in Mainland China. Since food rationing was literally abandoned in 1993, the present study can also provide some insight into consumption behavior in the free- market-driven economy. The survey data from 1985-1991 were obtained from the published sources (SSB, 1985-1991). Since 1992, the content and structure of survey data published have been revised, leading to the unavailability of consumption (i.e, quantity) data for many specific food items at the provincial level. Fortunately, we have acquired unpublished

survey data for 1992-1994 directly from the SSB. The unpublished surveys from 1992-1994 include more detailed categories of food numbering more than 84 food items as compared with 23 food items in the published sources for previous years. Aggregation has been carried out carefully in order to match these items categorized in the published data of previous years when entire period data from 1985 to 1994 are used in the estimation.

From the published sources before 1992, the average consumption (i.e.,quantity) ,expenditure data for 23 foods and related items by city residents were available for 28 cities and provinces[1]. There is a total of 288 observations when using the data from 1985-1994 and 91 observations while using the data from 1992-1994. In the survey, food items include grain (including coarse grain, fine grain, flour, rice, other grains), vegetable oil, fresh vegetables, dry vegetables, pork, beef and mutton, poultry, eggs, sugar, fish, cigarettes, tobacco, white spirit, beer, other spirit, tea, fresh melons, fresh fruit, dried fruit, candy, cake, fresh milk, canned meats, and other canned food. The current study covers more food items than any other previous studies. The food items that will be included in this study are (1) flour, (2) rice, (3) vegetable oil, (4) pork, (5) beef and mutton, (6) poultry, (7) fish, (8) egg, (9) fresh vegetable, (10) fresh and dried melon and fruits, (11) fresh milk, (12)sugar, (13) Cigarettes, and (14) spirit, (15) sticky rice, (16) steam buns, (17) bread , and (18) coarse grain. All these food items are essential in traditional Chinese diets. Taking 1994, for example, these 18 food items accounted for more than 70 percent of total food expenditure, and 31.8 percent of total living expenditure at the national level. From the selection of food items in this study, it is apparent that special attention is given to meat and meat-related products as well as grain products. The expenditure and income data used in the study are all expressed in nominal terms. The prices of various food items are derived from dividing the expenditure by the quantity of food purchased. As treated in previous studies using data from same survey, we assume all purchased foods were consumed, and no waste occurred during the consumption.

One important phenomenon of Chinese urban food consumption has been food rationing. In fact, food rationing had been in effect since 1949 and lasted until 1993. During this period of time, grain and vegetable oil had always been under rationing, while the rationing for the other products

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[2]Since 1991, the separated data for Hainan and Tibet have been also available except for Tibet in 1994. Hainan was included in Guangdong for previous years. The total number of cities and provinces are 30.

such as meat, sugar, spirit, or cigarette tended to be more localized. As Wang and Chern's study shows, food rationing distorts the food consumption behavior of urban residents in Mainland China. Considering the scope of this study, the formal inclusion of food rationing effect will not be carried out. However, we will examine the effects of food rationing by estimating the model for separate periods, 1985-1994 and 1992-1994. After May, 1993, food rationing has basically been eliminated. When estimating the period from 1992-1994, two dummy variables for the years 1992 and 1993 will be introduced to investigate the difference in consumption behavior during the different periods of time.

The study will make use of a two-stage LA/AIDS model to estimate Chinese food demand structure in two stages to gain a better understanding of the consumption pattern in urban areas. By doing this, we assume that Chinese urban residents make a decision on food expenditure in two stages, and weak separability among these food groups, and food items within each food group is assumed. In observing the Chinese diet customs of treating staple and non-staple grains, and "meat " and "vegetables" separately, the two-stage consumption behavior is a reasonable assumption. In the first stage, eight food or food groups are included in the demand system. Namely, they are grain, vegetable oil, meat and meat-related products, vegetables, sugar, spirit and beer, cigarette, and fresh/dried fruits and melons. The estimation will be made separately for the periods, 1984-1994 and 1992-1994.

Considering the large discrepancy in food consumption behavior, this study will represent the first attempt ever to analyze regional food consumption behavior. As shown in Table 10, the whole country will be divided into six regions (Northeast, North, Northwest, Central, East, and South), corresponding to those used in the CPPA model of the ERS of USDA. However, caution should be taken when explaining the differences in the estimated parameters due to the limited observations. Some regions have less than 40 observations.

Table 10
Regional Coverage

Region	Provinces
Northeast	Heilongjiang, Liaoning, Jilin
North	Hebei, Henan, Shanxi, Shangdong, Tianjin, Beijing
Northwest	Neimongol, Ningxia, Xingjiang, Qinghai, Gansu, Shaanxi, Tibet
Central	Jiangxi, Hunan, Hubei, Sichuan
East	Jiangsu, Anhui, Zhejiang, Shanghai
South	Fujian, Guangdong, Guangxi, Guizhou, Yunan, Hainan

Table 11
Coverage of Provinces in the Coastal and Inland Regions

Region	Provinces
Coast Region	Liaoning, Beijing, Hebei, Tianjian, Shanghai, Shangdong, Jiangsu Zhejiang, Fujian, Guangdong, Guangxi, Hainan
Inland Region	(rest of provinces in China)

We will also try to divide the country into the coastal, and inland regions in order to analyze the regional differences in consumption behavior in a more compact way. The partition is shown in Table 11, and the map of Mainland China is shown in Appendix A. As is well-known, the coastal region is a more prosperous area, with the average income much higher than in the inland area. Coastal provinces account for most agricultural exports and imports in Mainland China. With the rapid increases in personal income, and fast change in food consumption behavior, it is important to understand the agricultural trade potential in the coastal area.

In the second stage, the estimation for the two sub-food groups, namely, grain, and meats and meat related commodities is carried out. Because of the inconsistency between the data classifications before and after 1992, and a more detailed categorization in the surveys carried out in 1992-1994, we will only use the data for 1992-1994 in this stage. The LA/AIDS is used again for both sub-food groups. The grain group consists of rice, sticky rice, standard flour, enriched flour, bread, steam bun, other fine grains, and coarse grain. The meat group is made up of pork, beef, mutton, poultry, eggs,

aquatic products, fresh milk, and other meats and meat products. Separate estimation for the coastal and inland regions will be obtained for comparison.

5.2 Estimation Procedures

The Iterative Seemingly Unrelated Regression (ITSUR) is used to estimate the demand system. There are a total of eight demand equations in the system. Because the adding-up condition is satisfied automatically with the aggregation of budget shares up to one, only seven equations are estimated. When using the ITSUR, it makes no difference which equation is left out. (Barten 1965). The homogeneity and symmetry conditions will be imposed through parameter restrictions. Weak separability is assumed for this group of foods, implying that the demand for these eight foods are weakly separable from the demand for the other foods, and other goods and services.

5.3 Test of Homogeneity and Symmetry Condition

Gallant and Jorgenson (1979) showed that the change in the least squares criterion can be used as an asymptotically valid chi-squared test. In order to check the validity of the homogeneity and symmetry conditions, we need only to compare the difference between the objective values for a less restrictive model (no imposition of homogeneity and symmetry conditions and for a more restrictive model (with the imposition of both conditions).

Formally, the test statistic is:

$$T_0 = NS^* - NS$$

where N = number of observations,

S*= optimal objective value of the restrictive model (i.e., with imposition of homogeneity and Symmetry)

S = optimal objective value of the unrestrictive model (i.e., without the imposition of above conditions).

Gallant and Jorgenson showed that T_0 has a chi-square distribution under the null hypothesis of the more restrictive model. The degrees of freedom are computed by the difference in the number of free parameters between the restrictive model and unrestrictive model. In our demand system, there are 70 free parameters when homogeneity and symmetry conditions are not imposed, and 42 free parameters in the model with restrictions.

Tables 12 lists the estimated T_0 for various model specifications. As we can see, except for the homogeneity condition for the coastal region (1992-1994), all other homogeneity, symmetry, as well as both conditions imposed have been rejected, indicating that the properties of the demand system derived from the neoclassical theory of utility maximization cannot be satisfied with the budget data obtained from Chinese urban households during 1985-1994, or 1992-1994. The changes in preference of urban consumers, and other non-market factors may be reasons. However, the x^2 statistics are much smaller in all cases when only data for 1992-1994were used, as compared with the other sample period of 1985-1994. These differences may indicate that the consumption behavior in recent years has been more consistent with neoclassical consumer theory than that observed in earlier years of economic reform when food rationing was strongly effective.

In addition, the homogeneity condition can be more appropriately tested for each equation in the demand system. The test statement in the SYSLIN procedure of the SAS program is carried out to conduct an F-test. One should note that it is based on the large sample theory and its validity in the finite sample is not known. Except for the models for 6 different regions, all the demand equations in other specifications are tested. The results are presented in Table 13. The F-statistics show that the homogeneity condition is rejected at 5 percent significance level in 44 of 84 equations. It is also interesting to note that the homogeneity condition is more likely to be satisfied when the equation is estimated with data from more recent years (i.e., 1992-1994). When data from 1985 to 1994 are used in the national (whole country) model, no equation satisfies homogeneity condition. However, when we use only data from 1992 to 1994, there are 5 equations that satisfy this condition. Regional models also follow this pattern of testing results. The coastal region has more equations satisfying the homogeneity condition than the inland region in 1992-1994. These results may imply that the consumption behavior of urban Chinese households in recent years and in the coastal region is more consistent with the properties of neoclassical consumption theory.

Table 12

Test Statistics for Homogeneity and Symmetry Conditions[a]

Model	Homogeneity	Symmetry	Both
first stage with data from 1985-1994	531	270	746
first stage with data from 1992-1994	24.92	121.65	200.57
first stage coast 1985-1994	154.84	148.69	416
first stage coast 1992-1994	7.632	187.70	244.07
first stage inland 1985-1994	160	253	340
first stage inland 1992-1994	31.67	96.27	153.35
Region Northeast 1985-1994	31.50	169.23	262.6
Region North 1985-1994	21.76	197.13	279.80
Region Northwest 1985-1994	195.36	154.65	250.94
Region Central 1985-1992	81	142.78	264.21
Region East 1985-1992	113.27	125.37	187.37
Region South 1985-1992	86.94	129.07	249.63
grain subgroup 1992-1994	125.51	66.01	173.38
grain subgroup coast 1992-1994	150.76	82.84	235.65
grain subgroup inland 1992-1994	45.17	70.29	118.02
meat subgroup 1992-1994	15.90	178.42	207.68
meat subgroup coast 1992-1994	113.46	74.77	111.66
meat subgroup inland 1992-1994	16.95	150.26	165.54

[a] The number of restrictions are 7, 21, and 28 respectively, when homogeneity, symmetry, and both homogeneity and symmetry conditions are imposed. The critical values are $x^2_7(0.05)=14.1$, $x^2_{21}(0.05)=32.7$, and $x^2_{28}(0.05)=41.3$, respectively.

Table 13
Test of Homogeneity Condition By Equation[a]

A: First Stage Demand System

Model	grain	veg. Oil	meats	vegetable	sugar	spirits	cigarette
whole country (85-94)	[b]						
whole country (92-94)	✓		✓	✓	✓		✓
coast (85-94)			✓			✓	✓
coast (92-94)		✓	✓	✓	✓	✓	✓
inland (85-94)	✓	✓				✓	
inland (92-94)	✓			✓			✓

B: Meat Subgroup

Model	pork	beef	mutton	poultry	eggs	aquatic products	fresh milk
whole country (92-94)		✓	✓			✓	
coast (92-94)	✓	✓			✓	✓	
inland (92-94)		✓	✓			✓	✓

C: Grain Subgroup

Model	rice	sticky rice	standard flour	enriched flour	bread	steam bun	other fine grain
whole country (92-94)			✓		✓	✓	
coast (92-94)					✓		✓
inland (92-94)		✓	✓			✓	✓

[a]'✓' denotes that the homogeneity condition can not be rejected at 5 percent significance level for the equation.
[b]Blank denotes that the homogeneity condition is rejected at 5 percent significant level for the equation.

5.4 Goodness of Fit

R-squared values can be used to judge the goodness of fit of the model. Table 14 shows the R^2 for various model specifications in the first stage. For grain, vegetable oil, meats, and cigarettes, the model fits nicely with an R-squared value of around or greater than 0.50. For grain, vegetables, and sugar, the model for the inland region has a higher R-squared value than the coastal region, while the models for vegetable oil, meats, spirit, and cigarettes in the coastal region have a better fit than those in the inland region. Imposition of homogeneity and symmetry conditions does reduce the R-squared value noticeably, especially for the commodities such as vegetables, sugar, and spirits.

One should note that grain and oil were under rationing in 1992 and part of 1993. Food rationing may have distorted the consumption behavior of rational utility maximizers in a imperfect competitive market. For detecting this effect, two dummy variables for years 1992 and 1993 were introduced in the model estimated for 1992-1994. We found that the model has better fit than that without the dummy variables, showing a higher adjusted R^2 for most equations. These two dummy variables are statistically significant in the equations of grain, vegetable oil, and spirits. The t-ratios in Table 15 show that the expenditure on grain and vegetable oil is much lower in 1992 and 1993 before the elimination of food rationing, and more expenditure is spent on other items such as spirits. This result confirms the spillover effects of rationing policy in China found by Wang and Chern (1990).

Table 14
The R-squared Values of AIDS Models in First Stage[a]

Model	Grain	Veg. Oil	Meats	Vegetables	Sugar	Spirits	Cigarettes
Whole country (1985-1994)	0.61 (0.76)	0.58 (0.64)	0.44 (0.68)	0.02 (0.35)	0.17 (0.37)	0.26 (0.51)	0.23 (0.42)
Whole (1992-1994)	0.62 (0.70)	0.53 (0.61)	0.57 (0.73)	0.05 (0.31)	0.22 (0.24)	0.19 (0.54)	0.51 (0.57)
Whole with dummy (1992-1994)	0.66	0.56	0.60	0.03	0.25	0.35	0.51
Coast (1985-1994)	0.49 (0.76)	0.65 (0.73)	0.65 (0.82)	-0.22 (0.37)	0.21 (0.56)	0.41 (0.71)	0.48 (0.56)
Coast (1992-1994)	0.52 (0.81)	0.62 (0.76)	0.73 (0.84)	-0.35 (0.52)	0.14 (0.59)	0.53 (0.74)	0.69 (0.85)
Inland (1985-1994)	0.74 (0.79)	0.57 (0.64)	0.35 (0.58)	0.46 (0.60)	0.34 (0.45)	0.16 (0.38)	0.34 (0.49)
Inland (1992-1994)	0.72 (0.79)	0.41 (0.58)	0.41 (0.68)	032 (0.53)	0.25 (0.37)	0.10 (0.43)	0.39 (0.61)

[a] Figures in the parentheses are R-squared values from the unrestricted models.

Table 15
T-ratios for Yearly Dummy Variables of 1992 and 1993 in First Stage

Dummy variable	grain	veg. oil	meats	vegetables	sugar	spirits	Cigarettes
1992	-2.45	-.207	-0.72	-0.87	-0.57	5.46	0.22
1993	-2.82	-1.53	-0.72	0.52	-1.45	3.55	1.19

For the meat group at the national level, the R-squared values are low except for poultry, fish, and fresh milk with the r-squared values around 0.5 (Table 16). However, one should note that most R-squared values are much higher in the coastal region, indicating a much better fit of the model for this region. One intuitive explanation is that consumers in the coastal region behaved more like utility maximizers and, thus, are more responsive to changes in prices and income. Markets in the inland area tend to be more affected by other factors such as availabilities rather than prices and income. One should also note the low R-squared value for beef. One major distortion in the beef consumption is market accessibility. In Mainland China, most beef is produced and consumed in the west (inland) area where the people have less income, while in the prosperous coastal region, due to the supply constraint and dietary habit, the consumption of beef is much lower. Incorporation of supply constraints into the model in the future may help improve the analysis.

In the grain subgroup, the R-squared values are relatively high for rice, sticky rice, enriched flour, and bread. With the same logic of reasoning as mentioned above, the R-squared values are higher in the coastal region for most grain products. The R-squared values for standard flour and steam buns are comparatively low. This may be due to the fact that the consumption behavior of grain is more differentiated between the North and South of the country compared to the coastal and inland regions. This result also indicates the importance of analyzing the regional consumption behavior in a large country like Mainland China. In the later part of the study, an attempt is made to analyze and compare the consumption behavior in six regions.

Models are also estimated separately for the grain and meat groups with the dummy variables for 1992 and 1993. As shown in Table 14, the goodness of fit for the grain subgroup is significantly improved by incorporating these dummy variables, while there is no substantial improvement for the meat group, as expected. Because meat commodities were not under rationing during this period of time, inclusion of yearly dummy variables did not enhance the explanatory power of the model. However, it is completely the opposite case for the grain group.

From the t-ratios listed in Table 17, we can see that the dummy variables are statistically significant at the 5 percent level for rice, sticky rice, standard flour steam buns, pork, and eggs. Urban consumers spent less on rice and pork in 1992 and 1993, and more on other commodities such as standard flour, steam buns, and eggs.

5.5 Estimates of Elasticities[2]

Tables 18-24 present the price and expenditure elasticities from different model specifications covering different regions and time periods in the first stage. Because we would prefer to have the theoretically consistent estimates, only the estimates with both homogeneity and symmetry conditions imposed are presented in these tables.

Table 18 displays the estimates for 1985-1994, covering all provinces in country. These estimates show that the own-price elasticity of meat is higher than that for grain and vegetable oil. Fruits and melons have the highest price elasticities. Cigarettes , fruits and melons, spirit and beer, vegetables, and grain have expenditure elasticities greater than one, indicating that as the total expenditure on this selected eight food group increases by one percent, the demand for these items will increase by more than one percent. The results also show that meats are a substitutes for most other food items, while cigarette is complementary to all the food items in the group.

[3] Parameter estimates for different model specifications except the six regional models are presented in Appendix B.

Table 16
R-squared Values in Second Stage [a]

A: Meat Subgroup

Model	Pork	Beef	Mutton	Poultry	Egg	Fish	Fresh Milk
Whole country (1992-1994)	0.20 (0.48)	0.19 (0.33)	0.13 (0.41)	0.52 (0.72)	0.19 (0.55)	0.45 (0.56)	0.44 (0.58)
Whole with Dummy(1992-1994)	0.39	0.11	0.11	0.53	0.01	0.56	0.42
Coast (1992-1994)	0.65 (0.74)	0.12 (0.46)	0.60 (0.80)	0.47 (0.83)	0.68 (0.84)	0.59 (0.74)	0.45 (0.83)
Inland (1992-1994)	0.26 (0.64)	0.11 (0.31)	0.15 (0.64)	0.44 (0.68)	0.16 (0.57)	0.26 (0.37)	0.48 (0.64)

B: Grain Subgroup

Model	Rice	Sticky Rice	Standard Flour	Enriched Flour	Bread	Steam buns	Other fine grains
Whole country (1992-1994)	0.64 (0.80)	0.51 (0.61)	0.38 (0.52)	0.54 (0.61)	0.55 (0.60)	0.34 (0.44)	0.35 (0.47)
Whole with dummy (1992-1994)	0.79	0.54	0.52	0.56	0.62	0.42	0.41
Coast (1992-1994)	0.71 (0.92)	0.71 (0.86)	0.36 (0.80)	0.63 (0.83)	0.38 (0.72)	0.70 (0.78)	0.44 (0.67)
Inland (1992-1994)	0.64 (0.79)	0.55 (0.61)	0.41 (0.49)	0.50 (0.65)	0.55 (0.62)	0.24 (0.32)	0.67 (0.77)

[a] Numbers in parentheses are R-squared value in the unrestricted model.

Table 17
T-ratios for Yearly Dummy Variable of 1992 and 1993 in Second Stage

A: Grain Subgroup

year	rice	sticky rice	standard flour	enriched flour	bread	steam buns	other fine grain
1992	-8.25	3.26	4.50	1.46	2.37	2.60	2.62
1993	-6.32	2.98	3.33	1.75	1.11	2.62	1.42

B: Meat Subgroup

year	pork	beef	mutton	poultry	eggs	fish	fresh milk
1992	-2.15	-1.05	-0.83	-2.29	3.71	1.06	1.18
1993	-2.13	-1.51	-0.85	-1.34	4.71	0.66	1.00

The computation of income elasticity (e_i) for each food group in the first stage takes the form of:

e_i = expenditure elasticity * income elasticity of the selected 8 food group with respect to total living expenditure.

The latter elasticity is obtained from the linear regression of a double-log function with the data consistent with the different model specifications, and is listed in the footnote of the corresponding table.

The results show that the income elasticities for vegetables, spirit and beer, cigarettes, and fruits and melons are greater than one, indicating that expenditures on these items will increase much faster when income (i.e., total living expenditure) increases.

Table 19 shows the estimation results for the period of 1992-1994. The price elasticities for vegetable oil, vegetables, and sugar are lower than those estimated with data from 1985-1994. The expenditure elasticity is higher for the meat group, and lower for grains, vegetable oil, spirits and beer, cigarettes, and fruits and melons than the corresponding elasticities for 1985-1994. These results may signal two changes in urban food consumption in recent years. First, urban residents consumed more meats in recent years as indicated by the higher expenditure elasticity. Second, the elimination

of food rationing in 1993 reduced the consumption of other non-staple foods such as spirits, cigarettes, and fruits and melons, confirming Wang and Chern's prediction in their study.

Both expenditure and income elasticities for meats are relatively low. This is somewhat surprising, because other Asian countries have higher consumer demand for meats at similar income levels (Garnaut and Ma, 1992). However, as observed in the previous descriptive analysis, the expenditure share of meats in total living expenditure actually decreased during the entire period of 1987-1994. Specifically, the share increased steadily from 1987 to 1989, and then declined rapidly from 18.53 percent in 1989 to 15.22 percent in 1994. In addition, Li (1995) also mentioned that Chinese diet pattern differs from that of other countries, and some recent surveys show that meat consumption of sample family in the surveys did not increase much as their income grows. The respondents in these surveys indicated that they prefer more fish and fruits to red meats. As red meat accounts for most of meat consumption in China, following this logic, the expenditure elasticity is also reasonable. The low income elasticity for meats is also confirmed by Huang and Rozelle (1994). Their estimated income elasticity of meat of about 0.046 is even much lower than ours. They used data from Zhejiang province, where the average income is higher than the national average.

The other surprising result is the high expenditure and income elasticities for grain products, even though they are lower when estimating with data for 1992-1994. There are no obvious reasons for this puzzling result. The elimination of food rationing, in fact, eliminated the price subsidy of grain for urban consumers. Therefore, urban residents have to spend much more on grain than previous time. We observe that the consumption of grain in terms of quantity did decline rapidly during past years. However, after the declines in three consecutive years in 1990s, expenditure share of grain recovered to 7.08 percent. More consumption of high quality grain products may also contribute to this phenomenon.

Tables 20 and 22 show the estimated elasticities for the coastal and inland regions during 1985-1994. Price elasticities for vegetable oil and sugar are positive for the coastal region which indicates a violation of the Law of Demand for Chinese urban consumers in the coastal region. The coastal region's expenditure elasticities for vegetable oil, spirit and beer, cigarettes, and fruits and melons are much higher, and for grain, it is much lower than those in the inland region, suggesting that the coastal region will spend more on the vegetable oil, spirit, and fruits, and less on grain than

consumers in the inland region. Vegetables and spirits are price elastic in the coastal region, while only vegetables are price elastic in the inland region. In both regions, the price elasticities of vegetables, spirits, fruits and melons are higher than those of grain and meats.

Tables 21 and 23 shows the estimates for the coastal and inland regions during the period of 1992-1994. All the own price and expenditure elasticities have the expected signs. The results show that the coastal regions is more price responsive for grain, vegetable oil, meats, vegetables, cigarettes, and fruits and melons, and less so for sugar and spirits. This may be partly attributed to the more mature development of the market economy in the coastal region. Expenditure elasticities for vegetable oil, vegetables, spirits, cigarettes, and fruits and melons are higher, those for grain, meats, and sugar are lower in the coastal region than in the inland region. When comparing the results from 1985- 1994 with 1992-1994, we find that the expenditure elasticity is smaller for spirits and beer, and fruits and melons, and larger for meats using the recent data of 1992-1994, indicating that there is a propensity for increasing expenditure on meat products for both coastal and inland areas.

Table 24 shows the estimated price and expenditure elasticities in six regions in China for the period of 1985-1994. The limitation of the data in relation to the number of parameters estimated necessitates some caution in interpreting these elasticities. In general, the results confirm the large discrepancy in food consumption behavior in different regions in China. For example, the expenditure elasticity for grain is the highest in the South (1.747), while it is the lowest in the East. The reason for the large expenditure in the South may be because the price of grain soared in recent years in this region, where the grain market has been strained by continuous declines in agricultural production in recent years. No region has a negative grain expenditure elasticity, implying that grain is still a normal good in China. Expenditure elasticities for meats also vary greatly across regions. The North has the highest of 1.355, while it is only 0.084 in the South. Expenditure elasticities for vegetables are all greater than one in most regions except the North, indicating the tendency for a larger share of vegetable expenditure in the selected food groups. Most regions also have large expenditure elasticities for spirits, cigarettes, fruits and melons. These commodities are likely to have a larger share in food expenditure in the future.

As expected, own price elasticities are negative for most food items. Meats have a higher price elasticity than grain in most regions except the South. Grain is most price responsive in the South, and least in the East. Meat is price elastic in the Northeast, North, and East. Spirits are price elastic in the Northeast and East. Consumption of cigarettes is price inelastic in all regions except for the South, while the price elasticities for fruits and melons are greater than one, and near unitary, representing that the demand for this food item is price elastic. In general, a uniform percentage decrease in the prices of the selected food groups would elicit more demand for meat and fruits than grain.

Table 18
Estimated Expenditure and Price Elasticities from AIDS (First Stage)
1985-1994
(With Homogeneity and Symmetry Conditions Imposed)

	Prices of								Expenditure Elasticities	Income Elasticities[e]
Products	Grain[a]	Veg. Oil	Meats & related[b]	Vegetables	Sugar[c]	Spirit & beer	Cigarettes	Fruits & Melons[d]		
Grain	-0.622	0.008	-0.115	-0.278	-0.027	0.051	-0.187	0.000	1.170	1.085
Veg. oil	0.086	-0.322	-0.477	0.079	-0.012	0.104	0.012	-0.352	0.882	0.815
Meats	0.118	-0.025	-0.783	0.241	0.006	0.030	0.055	0.132	0.226	0.209
Vegetable	-0.382	-0.001	0.153	-0.118	-0.001	-0.107	0.034	-0.004	1.428	1.319
Sugar	-0.412	-0.045	0.054	0.090	-0.534	0.150	-0.285	0.291	0.691	0.572
Spirit & beer	0.045	0.044	-0.428	-0.397	0.017	-0.954	-0.101	-0.157	1.932	1.785
Cigarettes	-0.612	-0.050	-0.471	-0.043	-0.050	-0.076	-0.564	-0.277	2.149	1.986
Fruits & Melons	-0.114	-0.203	-0.079	-0.062	0.019	-0.076	-0.196	-1.087	1.798	1.661

[a] Grain does not include potato and potato products.
[b] Meats include pork, beef, mutton, poultry, aquatic products, eggs, and fresh milk.
[c] Sugar does not include candy.
[d] Fruits & melons include both dried and fresh ones.
[e] Income elasticity is calculated as the product of expenditure elasticity and the income elasticity of the selected group, which is 0.924.

Table 19
Estimated Expenditure and Price Elasticities from AIDS (First Stage)
1992-1994
(With Homogeneity and Symmetry Conditions Imposed)

Products	Prices of								Expenditure Elasticities	Income Elasticities[e]
	Grain[a]	Veg. Oil	Meats & related[b]	Vegetables	Sugar[c]	Spirit & beer	Cigarettes	Fruits & Melons[d]		
Grain	-0.565	0.102	-0.465	-0.214	0.007	0.161	-0.158	0.052	1.079	0.989
Veg. oil	0.402	-0.395	-0.732	0.276	-0.050	0.129	-0.156	-0.281	0.808	0.741
Meats	-0.105	-0.079	-0.537	0.160	0.004	-0.087	0.052	0.082	0.508	0.466
Vegetable	-0.303	0.076	0.139	-1.008	-0.018	-0.031	-0.136	0.004	1.277	1.171
Sugar	0.238	-0.365	0.129	-0.300	-1.130	-0.001	0.466	0.164	0.800	0.734
Spirit & beer	0.571	0.115	-1.175	-0.127	-0.005	-0.911	0.180	-0.130	1.482	1.309
Cigarettes	-0.517	-0.163	0.343	-0.347	0.032	0.077	-0.419	-0.319	1.997	1.831
Fruits & Melons	0.011	-0.206	-0.068	-0.041	0.007	-0.071	-0.257	-0.981	1.606	1.427

[a] Grain does not include potato and potato products.
[b] Meats include pork, beef, mutton, poultry, aquatic products, eggs, and fresh milk.
[c] Sugar does not include candy.
[d] Fruits & melons include both dried and fresh ones.
[e] Income elasticity is calculated as the product of expenditure elasticity and the income elasticity of the selected group, which is 0.917.

Table 20
Estimated Expenditure and Price Elasticities in the Coastal Region from AIDS (First Stage)
1985-1994
(With Homogeneity and Symmetry Conditions Imposed)

Cigarette	Prices of								Expenditure Elasticities	Income Elasticities[e]
	Grain[a]	Veg. Oil	Meats & related[b]	Vegetables	Sugar[c]	Spirit & beer	Cigarettes	Fruits & Melons[d]		
Grain	-0.474	-0.010	-0.212	-0.216	-0.021	0.081	-0.077	0.097	0.832	0.757
Veg. oil	-0.131	0.151	-0.876	-0.144	-0.117	-0.002	-0.069	-0.216	1.403	1.277
Meats	0.002	-0.037	-0.659	0.171	-0.022	0.018	0.087	0.085	0.358	0.326
Vegetable	-0.316	-0.037	0.099	-1.174	0.059	0.102	0.022	-0.085	1.330	1.210
Sugar	-0.044	-0.401	-0.375	1.290	0.474	-0.352	-0.108	0.712	-0.196	-1.088
Spirit & beer	-0.044	-0.057	-0.908	0.093	-0.104	-1.018	-0.285	-0.490	2.813	2.560
Cigarettes	-0.405	-0.075	-0.237	-0.082	-0.046	-0.181	-0.806	-0.401	2.235	2.033
Fruits & Melons	-0.028	-0.108	-0.332	-0.214	0.036	-0.195	-0.245	-0.891	1.978	1.800

[a] Grain does not include potato and potato products.
[b] Meats include pork, beef, mutton, poultry, aquatic products, eggs, and fresh milk.
[c] Sugar does not include candy.
[d] Fruits & melons include both dried and fresh ones.
[e] Income elasticity is calculated as the product of expenditure elasticity and the income elasticity of the selected group, which is 0.91.

Table 21
Estimated Expenditure and Price Elasticities in the Coastal Region from AIDS (First Stage)
1992-1994
(With Homogeneity and Symmetry Conditions Imposed)

Products	Prices of								Expenditure Elasticities	Income Elasticities[e]
	Grain[a]	Veg. Oil	Meats & related[b]	Vegetables	Sugar[c]	Spirit & beer	Cigarette s	Fruits & Melons[d]		
Grain	-0.761	0.245	-0.226	-0.337	0.007	0.026	-0.121	0.175	0.993	0.864
Veg. oil	0.794	-0.853	-1.009	-0.355	0.034	0.270	-0.029	0.147	1.002	0.872
Meats	0.010	-0.074	-0.696	0.316	-0.026	-0.038	0.075	0.001	0.433	0.385
Vegetable	-0.452	-0.144	0.508	-1.123	0.005	0.096	-0.258	-0.223	1.591	1.384
Sugar	0.437	0.314	-1.099	0.456	-0.227	-0.408	0.972	0.448	-0.894	-0.778
Spirit & beer	-0.165	0.220	-1.484	0.167	-0.092	-0.625	-0.293	-0.446	2.721	2.367
Cigarettes	-0.419	-0.064	-0.170	-0.602	0.082	-0.154	-0.478	-0.148	1.953	1.699
Fruits & Melons	0.192	0.045	-0.554	-0.353	0.017	-0.161	-0.087	-0.747	1.648	1.434

[a] Grain does not include potato and potato products.
[b] Meats include pork, beef, mutton, poultry, aquatic products, eggs, and fresh milk.
[c] Sugar does not include candy.
[d] Fruits & melons include both dried and fresh ones.
[e] Income elasticity is calculated as the product of expenditure elasticity and the income elasticity of the selected group, which is 0.87.

Table 22
Estimated Expenditure and Price Elasticities in the Inland Region from AIDS (First Stage)
1985-1994
(With Homogeneity and Symmetry Conditions Imposed)

Products	Prices of								Expenditure Elasticities	Income Elasticities[e]
	Grain[a]	Veg. Oil	Meats & related[b]	Vegetables	Sugar[c]	Spirit & beer	Cigarette s	Fruits & Melons[d]		
Grain	-0.635	0.042	-0.206	-0.290	-0.031	0.023	-0.216	-0.044	1.357	1.248
Veg. oil	0.361	-0.586	-0.414	0.237	0.068	0.123	0.078	-0.287	0.420	0.386
Meats	0.075	-0.054	-0.759	0.191	0.011	0.022	0.004	0.108	0.402	0.370
Vegetable	-0.373	0.026	0.086	-0.965	-0.029	-0.153	0.008	0.015	5.380	1.274
Sugar	-0.551	0.286	0.145	-0.422	-0.852	0.321	-0.540	0.486	0.127	1.037
Spirit & beer	0.142	0.080	-0.091	-0.410	0.062	-0.816	-0.029	-0.011	1.072	0.986
Cigarettes	-0.592	-0.023	-0.494	-0.054	-0.071	-0.057	-0.385	-0.147	0.085	1.661
Fruits & Melons	-0.097	-0.189	0.062	0.256	0.049	-0.022	-0.096	-1.111	1.385	1.269

[a] Grain does not include potato and potato products.
[b] Meats include pork, beef, mutton, poultry, aquatic products, eggs, and fresh milk.
[c] Sugar does not include candy.
[d] Fruits & melons include both dried and fresh ones.
[e] Income elasticity is calculated as the product of expenditure elasticity and the income elasticity of the selected group, which is 0.92.

Table 23
Estimated Expenditure and Price Elasticities in the Inland Region from AIDS (First Stage)
1992-1994
(With Homogeneity and Symmetry Conditions Imposed)

Products	Prices of								Expenditure Elasticities	Income Elasticities[e]
	Grain[a]	Veg. Oil	Meats & related[b]	Vegetables	Sugar[c]	Spirit & beer	Cigarettes	Fruits & Melons[d]		
Grain	-0.509	0.153	-0.515	-0.199	-0.002	0.066	-0.148	-0.062	1.210	1.089
Veg. oil	0.698	-0.777	-0.504	0.380	-0.019	0.037	-0.019	-0.231	0.434	0.391
Meats	-0.167	-0.089	-0.552	0.083	0.004	-0.035	-0.008	0.121	0.642	0.578
Vegetable	-0.252	0.107	0.034	-0.840	-0.021	-0.113	0.015	-0.047	1.119	1.007
Sugar	-0.008	-0.174	0.119	-0.409	-1.262	0.073	0.165	0.564	0.932	0.839
Spirit & beer	0.305	0.008	-0.438	-0.347	0.010	-0.747	-0.119	0.243	1.085	0.977
Cigarettes	-0.445	-0.089	-0.462	-0.077	0.007	-0.096	-0.087	-0.561	1.809	1.628
Fruits & Melons	0.159	-0.195	0.262	-0.106	0.043	0.119	-0.530	-0.739	1.306	1.175

[a] Grain does not include potato and potato products.
[b] Meats include pork, beef, mutton, poultry, aquatic products, eggs, and fresh milk.
[c] Sugar does not include candy.
[d] Fruits & melons include both dried and fresh ones.
[e] Income elasticity is calculated as the product of expenditure elasticity and the income elasticity of the selected group, which is 0.9.

Table 24
Estimated Expenditure and Price Elasticities in Six Regions from AIDS (First Stage)
During 1985-1994
(With Homogeneity and Symmetry conditions Imposed)

Region	Grain[a]	Veg. Oil	Meats & related[b]	Vegetables	Sugar[c]	Spirit & beer	Cigarettes	Fruits & Melons[d]
				Expenditure Elasticities:				
Northeast:	0.723	-0.052	0.990	1.333	-0.447	1.491	1.965	0.677
North	0.814	0.322	1.355	0.565	1.578	0.383	1.219	1.218
Northwest	1.275	0.627	0.631	1.331	1.491	1.184	1.076	1.093
Central	1.089	-1.271	0.569	1.051	-0.110	1.739	2.720	2.150
South	1.747	0.631	0.084	1.449	1.353	2.195	3.489	1.503
East	0.442	0.836	0.957	1.104	1.151	1.390	0.876	1.818
				Own Price Elasticities:				
Northeast	-0.577	-0.679	-1.090	-0.879	1.520	-1.105	-0.729	-1.219
North	-0.629	0.295	-1.299	-0.377	-0.993	-0.260	-0.279	-0.602
Northwest	-0.589	-0.232	-0.914	-1.004	-0.573	-0.763	-0.172	-1.062
Central	-0.640	-0.675	-0.644	-0.497	-0.394	-0.949	-0.439	-1.527
South	-0.968	-0.344	-0.635	-0.881	-1.057	-0.301	-1.170	-0.991
East	-0.210	-0.256	-1.182	-0.568	0.218	-1.298	-0.500	-0.925

[a] Grain does not include potato and potato products.
[b] Meats include pork, beef, mutton, poultry, aquatic products, eggs, and fresh milk.
[c] Sugar does not include candy.
[d] Fruits & melons include both dried and fresh ones.

Tables 25-30 display the estimated price and expenditure elasticities for the meat and grain subgroups with different model specifications during 1992-1994. Table 25 shows the estimated elasticities obtained with the data covering all the geographical regions of the country. Table 25 shows that mutton (-1.929), poultry (-1.836), eggs (-1.449), aquatic products (-1.097), and fresh milk (-1.745) all have a price elasticity greater than one in absolute value, meaning that they are price elastic. These results indicate that Chinese urban consumers become very sensitive to price signals for meat products. When the price of all meat products decreases by the same percentage, the consumer would spend more on these meat products. The price elasticity of pork is -0.739, which is inelastic. Given the large but declining expenditure share of pork in the meat consumption of Chinese diet (46 percent in 1987 to 39 percent in 1994), this result shows that the importance of pork in diet will continue to decline. With respect to expenditure elasticities, the estimates for poultry and aquatic products are all greater than one, pork has an expenditure elasticity near unity, and those of other meat commodities such as beef, eggs, mutton, and fresh milk are less than one. It would seem that urban consumers in Mainland China have spent proportionally less on beef, egg, mutton, and fresh milk, about the same proportion on pork, and much more on poultry and aquatic products as their income increases. In addition, most cross-price elasticities are less than the own price elasticities in absolute value, indicating that the consumers are more responsive to the product's own price change.

We should also notice that the expenditure elasticity for mutton is negative, the implication being that mutton is an inferior good. However, as mentioned earlier, caution should be taken when analyzing meat products such as beef , mutton, and even fresh milk in Mainland China. These products are mainly produced and consumed in the western part of the country where household income is lower than the eastern or coastal region, and market supply and consumer accessibility to these products in other regions may impose some distortion on market equilibrium. This explanation can be partly verified by the low R^2 values of the corresponding equations in the demand system as discussed earlier.

Tables 26 and 27 provide the comparisons of results obtained in the coastal and inland regions. Once again, most meat products in both regions are price elastic, indicating that a decrease in meat price will cause a rapid increase in meat demand. The price elasticities for mutton, beef, and other meats are higher, and for pork, poultry, eggs, aquatic products, and fresh milk are lower in the coastal region than in the inland region. The estimated expenditure elasticities imply that consumers in the coastal region will spend more on poultry, aquatic products, and fresh milk at the expense of other meat commodities such as beef and eggs. However, consumers in the inland region will continue increasing their expenditure on pork, poultry, and aquatic products at the expense of mutton, beef, eggs, and other meat products.

Table 28 presents the expenditure and price elasticities in the grain subgroup. To our surprise, all the grain products are price elastic except for bread. Standard flour and enriched flour have very high price elasticities of -3.016 and -4.313, respectively, and rice also has an elasticity of -2.432, implying that their demand will be very responsive to price change. As expected, flours are strong substitutes for rice as indicated by the large positive magnitude of the cross price elasticities. In most cases, the own price elasticities are larger than the cross price elasticities in absolute value. The expenditure elasticities for standard flour, enriched flour, and sticky rice are greater than one, which indicate that when expenditure in this grain group increases, the expenditure shares of these three items will increase at the expense of rice, bread, steam buns, coarse grain, and other fine grains. The expenditure elasticity of bread is negative. This may be due to the fact that Chinese consumers do not like western bread.

Table 25
Estimated Expenditure and Price Elasticities for the Meat Subgroup from AIDS (Second Stage)
1992-1994
(With Homogeneity and Symmetry Conditions Imposed)

Products	Prices of								Expenditure Elasticities	Income Elasticities[b]
	Pork	Beef	Mutton	Poultry	Eggs	Aquatic Products	Fresh Milk	Other Meats[a]		
Pork	-0.739	-0.076	-0.005	-0.260	0.384	-0.236	0.027	-0.143	1.048	0.488
Beef	-0.453	-0.044	-0.799	0.064	1.342	-0.317	0.264	-0.358	0.830	0.387
Mutton	1.083	-0.789	-1.929	1.048	0.802	2.371	-0.274	-0.240	-2.071	-0.965
Poultry	-1.051	-0.030	0.190	-1.836	0.100	-0.534	0.240	1.013	1.908	0.889
Eggs	1.264	0.521	0.147	0.298	-1.449	-0.055	-0.306	-0.675	0.256	0.119
Aquatic Products	0.861	-0.159	0.406	-0.406	-0.306	-1.079	0.198	0.101	2.105	0.981
Fresh Milk	0.555	-0.544	-0.609	1.393	-1.811	1.687	-1.745	0.459	0.615	0.287
Other Meats	-0.340	-0.210	-0.237	1.951	-1.256	0.600	0.165	-0.747	0.074	0.034

[a] Other meats include other red meats only.
[b] Income elasticity is calculated as the product of expenditure elasticity of a particular meat item and the estimated income elasticity of meat group from the first stage, which is 0.466.

Table 26
Estimated Expenditure and Price Elasticities for the Meat Subgroup in the Coastal Region from AIDS (Second Stage) 1992-1994
(With Homogeneity and Symmetry Conditions Imposed)

Products	Prices of								Expenditure Elasticities	Income Elasticities[b]
	Pork	Beef	Mutton	Poultry	Eggs	Aquatic Products	Fresh Milk	Other Meats[a]		
Pork	-0.815	0.260	0.074	-0.396	0.352	-0.434	0.055	-0.076	0.979	0.378
Beef	2.516	-2.218	0.075	-0.707	0.705	0.102	-0.581	0.611	-0.503	0.194
Mutton	1.470	0.130	-2.511	4.679	-2.912	0.841	0.047	-1.725	-0.018	0.007
Poultry	-1.099	-0.280	0.584	-1.016	0.511	-1.457	-0.028	0.926	1.857	0.715
Eggs	1.341	0.222	-0.452	0.966	-0.842	0.840	-0.435	-1.127	-0.513	-0.198
Aquatic Products	0.798	-0.075	0.030	-0.862	0.129	-0.499	0.163	0.106	1.805	0.695
Fresh Milk	0.594	-0.964	0.011	-0.068	-2.352	1.742	-1.539	1.342	1.235	0.475
Other Meats	-0.070	0.295	-0.463	2.102	-1.980	0.760	0.486	-1.327	0.197	0.076

[a] Other meats include other red meats only.
[b] Income elasticity is calculated as the product of expenditure elasticity of a particular meat item and the estimated income elasticity of meat group which is 0.385.

Table 27
Estimated Expenditure and Price Elasticities for the Meat Subgroup in the Inland Region from AIDS (Second Stage) 1992-1994
(With Homogeneity and Symmetry Conditions Imposed)

Products	Prices of								Expenditure Elasticities	Income Elasticities[b]
	Pork	Beef	Mutton	Poultry	Eggs	Aquatic Products	Fresh Milk	Other Meats[a]		
Pork	-1.180	-0.210	0.178	-0.171	0.080	0.010	0.024	-0.295	1.536	1.003
Beef	-0.875	0.266	-0.996	0.700	1.111	-0.483	0.093	-0.090	0.274	0.176
Mutton	2.577	-0.857	-1.716	0.301	1.023	1.033	-0.245	-0.088	-2.027	-1.301
Poultry	-0.629	0.279	-0.073	-2.050	-0.192	-0.185	0.235	0.809	1.924	1.235
Eggs	0.579	0.418	0.246	0.005	-1.512	0.038	-0.199	-0.188	0.614	0.394
Aquatic Products	0.196	-0.277	0.292	-0.073	-0.035	-1.830	0.344	0.242	1.141	0.733
Fresh Milk	0.636	0.192	-0.791	1.194	-1.315	1.868	-2.093	-0.651	0.960	0.616
Other Meats	-1.036	-0.070	-0.206	1.399	-0.327	0.537	-0.193	-0.333	0.228	0.146

[a] Other meats include other red meats only.
[b] Income elasticity is calculated as the product of expenditure elasticity of a particular meat item and the estimated income elasticity of meat group which is 0.642.

The high expenditure elasticity for grain, especially for flour (both standard and enriched) may seem surprising as mentioned earlier. The descriptive analysis of expenditure shares may help us get an intuitive answer. For both rice and flour, the expenditure shares have increased rapidly during 1987-1994, from 2.69 to 3.89 percent for rice, and 1.63 to 2.18 percent for flour while expenditure shares of most meat products declined during the same period. Urban consumers had to spend much more on grain products, as their prices surged during recent years.

In order to analyze the differences in consumption behavior of grain products between the coastal and inland regions, Tables 29 and 30 also present the elasticities estimated separately for these two regions. Almost all the major grain products are price elastic in both regions. In comparison, the consumption in the inland region has a much higher price elasticities for standard flour and enriched flour (i.e., -3.212 and -5.564, respectively) than those in the coastal region, while consumers in the coastal region are more responsive to changes in rice prices. In addition, the expenditure elasticities for standard flour, enriched flour, and steamed buns are higher in the inland region than those in the coastal region. These estimates may imply that inland consumers will spend more on these items while consumers in the coastal area tend to spend more on rice, sticky rice, etc. Expenditure elasticities for rice, sticky rice, and standard flour are greater than one, indicating that consumers in the coastal area will increase their shares of these grain products at the expenses of other grain products, while consumers in the inland region will spend more on sticky rice, flour, steam buns, and other fine grain.

Table 28
Estimated Expenditure and Price Elasticities for the Grain Subgroup from AIDS (Second Stage), 1992-1994 (With Homogeneity and Symmetry Conditions Imposed)

Products	Prices of								Expenditure Elasticities	Income Elasticities[a]
	Rice	Sticky Rice	Standard Flour	Enriched Flour	Bread	Steam Buns	Other Fine Grains	Coarse Grain		
Rice	-2.432	-0.015	0.736	0.599	-0.009	0.415	-0.176	0.050	0.831	0.822
Sticky Rice	-1.118	-1.238	-0.725	0.737	0.323	0.077	-0.141	0.628	1.458	1.442
Standard Flour	2.252	-0.061	-3.016	-0.244	0.045	-0.570	-0.415	-0.251	2.259	2.234
Enriched Flour	2.228	0.058	-0.232	-4.313	-0.521	-0.440	1.412	-0.078	1.886	1.865
Bread	0.931	0.137	0.658	-1.767	-0.184	-0.214	1.233	0.546	-1.339	-1.324
Steam Buns	2.750	0.017	-0.680	-0.458	-0.123	1.614	-0.309	-0.153	0.571	0.565
Other Fine Grains	0.551	-0.002	-0.194	1.369	0.212	-0.192	-1.327	0.152	0.533	0.527
Coarse Grain	1.550	0.292	-1.257	-0.225	0.668	-0.561	0.975	-1.624	0.183	0.181

[a] Income elasticity is calculated as the product of expenditure elasticity of a particular meat item and the estimated income elasticity of meat group which is 0.989.

Table 29
Estimated Expenditure and Price Elasticities for the Grain Subgroup in the Coastal Region from AIDS (Second Stage) 1992-1994
(With Homogeneity and Symmetry Conditions Imposed)

Products	Prices of								Expenditure Elasticities	Income Elasticities[a]
	Rice	Sticky Rice	Standard Flour	Enriched Flour	Bread	Steam Buns	Other Fine Grains	Coarse Grain		
Rice	-2.698	-0.012	0.511	0.481	-0.047	0.359	-0.095	0.051	1.449	1.252
Sticky Rice	-1.232	-1.194	-0.421	-1.045	0.549	0.106	0.461	0.537	2.239	1.932
Standard Flour	4.126	-0.046	-1.614	-2.072	0.106	-1.035	-0.895	0.017	1.413	1.221
Enriched Flour	4.126	-0.106	-1.830	-0.933	-0.319	-0.648	-0.371	-0.358	0.439	0.379
Bread	0.720	0.156	0.361	-0.514	-0.201	-0.320	0.652	0.097	-0.951	-0.862
Steam Buns	3.857	0.037	-0.888	-0.632	-0.200	-1.685	-0.020	-0.139	-0.330	-0.285
Other Fine Grains	0.184	0.050	-0.429	-0.223	0.150	-0.065	-0.136	0.079	0.390	0.337
Coarse Grain	1.932	0.280	0.107	-1.549	0.137	-0.640	0.486	-1.624	0.872	0.752

[a] Income elasticity is calculated as the product of expenditure elasticity of a particular meat item and the estimated income elasticity of meat group which is 0.864.

Table 30
Estimated Expenditure and Price Elasticities for the Grain Subgroup in the Inland Region from AIDS (Second Stage) 1992-1994
(With Homogeneity and Symmetry Conditions Imposed)

Products	Prices of								Expenditure Elasticities	Income Elasticities[a]
	Rice	Sticky Rice	Standard Flour	Enriched Flour	Bread	Steam Buns	Other Fine Grains	Coarse Grain		
Rice	-2.131	-0.022	0.740	0.738	0.003	0.410	-0.257	0.037	0.482	0.525
Sticky Rice	-1.357	-1.046	0.073	0.973	0.231	-0.531	0.025	0.546	1.086	1.183
Standard Flour	1.482	-0.003	-3.212	0.765	-0.059	-0.600	0.164	-0.405	1.868	2.034
Enriched Flour	1.865	0.060	0.907	-5.564	-0.200	-0.448	1.076	0.229	2.076	2.261
Bread	0.436	0.130	-0.171	-1.120	-0.059	0.523	0.534	0.031	-0.304	-0.331
Steam Buns	1.940	-0.058	-1.015	-0.565	0.088	-1.457	-0.053	0.025	1.096	1.194
Other Fine Grains	-1.200	0.002	0.336	1.245	0.053	-0.033	-1.709	0.240	1.067	1.162
Coarse Grain	1.255	0.244	-2.524	1.693	0.031	0.237	1.570	-1.884	-0.623	-0.678

[a] Income elasticity is calculated as the product of expenditure elasticity of a particular meat item and the estimated income elasticity of meat group which is 1.089.

5.6 Marginal Budget Shares (MBS)

The MBS can be used to measure the proportion of marginal expenditure increase in the future to be spent on a specific food item. In other words, if there is a one dollar increase in the total expenditure for the selected food groups in the model, MBS gives the percentage of this one dollar, or how many cents, to be spent on a particular food group. MBS can uncover how the consumer will spend their additional income or expenditure in the future.

The marginal budget shares (with respect to the selected food group) can be derived as the product of estimated expenditure elasticities and the expenditure share of the specific food commodity or food group in the model (Halbrendt, et al.). Expenditure shares used are the computed sample means according to different model specifications and time coverage. The marginal budget shares with respect to the total income can be further computed as the product of MBS in a selected food group and MBS of the all food groups in the model with respect to total living expenditure. The latter is computed through the linear regression with the total expenditure of all selected food items in the model as the dependent variable, and total living expenditure as the independent variable.

The MBS of a food item in the subgroup with respect to the total living expenditure can be computed as the product of the MBS of the food item with respect to the subgroup and the MBS of the subgroup with respect to the total living expenditure from the first stage.

Table 31 shows the MBSs with respect to the selected eight food groups in the model and MBSs with respect to the total living expenditure in the first stage corresponding to different model specifications. When estimating with the period from 1985 to 1994 for the whole country, we find that grain still accounted for a large budget share of 21.3 percent for the additional expenditure increase in the selected food groups, and vegetables, cigarettes, and fruits and melons also had shares greater than 15 percent. Meats only accounted for 8.8 percent. However, when we estimate the whole-country model with data only from 1992-1994, we find the MBS of meat increases dramatically to 20.5 percent, implying the larger share of meats if there is an increase in the total expenditure, while the MBSs of other food items in the group except vegetable oil decline. This finding indicated Chinese consumers did allocate more of their increased expenditure to meats in

recent years. In the meantime, Chinese consumers still spent a large part of additional food expenditure on grain and vegetables, which are main components in traditional Chinese diet. This result also confirms the results found by Halbrendt et al. that grain expenditure will remain substantial, though in absolute quantity, grain consumption will decrease. Expenditure shares for fruits and melons, cigarettes, and spirits will also remain large.

The estimates for different regions also follow the same pattern (Tables 2). The MBSs for meats in the coastal and inland regions also increased from 15.7 to 20 percent, and from 14.4 to 23.5 percent, respectively, when data from more recent years (1992-1994) are used.

The difference in the MBS between the coastal and inland region is obvious from the results (Table 31). In percentage, consumers in the coastal region only spend half of their additional income on grain as compared with those in the inland region. In stead, higher proportions of the additional expenditure were spent on vegetable oil, spirits, and fruits and melons. Given the higher income in the coastal region, they enjoy higher standard of living from the perspective of food consumption.

The differences in the estimated MBSs indicate the large discrepancies in spending the additional income for consumers among six regions. MBS for grain ranges from 6.2 percent in the East to 27.30 percent in the Northeast and 28.7 percent in the South. The high MBS of grain in the South will be attributed to the surging grain prices in the region. MBS for meats also differs greatly. MBS of meats exceeds forty percent in the both North and East region, while it is only 3.9 percent in the South. Except in the North, the vegetables will still make up a large share in the consumer additional food budget. Consumers in Central and South will spend much more additional money on cigarettes than other regions of the country, while consumers in Central and East will spend more additional income on fruits and melons.

As the MBSs of the eight selected food groups with respect to the total living do not vary much across different model specifications, e.g., from the lowest of 31.6 percent in the coastal region (1992-1994) to the highest of 34.95 in the inland region (1985-1994), the relative magnitude of MBSs with respect to total living expenditure does not change much among eight food groups. In

summary, consumers spent more than 5 percent of their additional income on grain, meats, vegetables, cigarettes, and fruits and melons, respectively.

Table 32 presents all the MBSs of food items in the meat and grain subgroups in the second stage. Only data from 1992-1994 are used in the estimation due to the inconsistency of data categorization before and after 1992. Consumers in the country as a whole spend most of the increased meat expenditure on pork, poultry, and aquatic products. Consumers in the coastal region spend much more of the additional meat expenditure on the aquatic products, and much less on pork than those in the inland region. Once again, the MBSs for beef and mutton should be used with caution considering the market situation for these two products in China.

When MBS of a commodity in the food group is multiplied by the MBS of subgroup with respect to total living expenditure, we derive the MBS of this food item with respect to total living expenditure, which is also listed in the Table 32.

As for the grain subgroup, consumption of rice, standard flour and enriched flour will use up most of consumer's additional grain expenditure. However, there were dramatic differences between consumers in the inland and coastal region. Consumers in the coastal region spent most of their extra grain expenditure on rice (83.91 percent), while consumers in the inland region spent less on rice, and much more on flour, steam buns, and other fine grains.

Table 31
Estimates of Marginal Budget Shares in the First Stages

unit: %

Model	Grain	Veg.oil	Meats	vegetables	Sugar	Spirits	Cigarettes	Fruits and melons	MBS With Respect to Total living Expenditure[b]
Based on the Expenditure of Selected 8 Food Groups:									
whole country (1985-1994)	21.30	3.90	8.80	21.60	0.70	9.80	16.70	17.30	a
Whole country(1992-1994)	19.40	4.20	20.50	18.30	0.60	6.64	16.10	14.30	a
Coast (1985-1994)	13.10	5.50	15.70	19.00	-1.10	13.50	14.60	19.70	a
Coast(1992-1994)	14.80	4.60	20.00	22.20	-0.60	11.30	12.80	14.90	a
Inland (1985-1994)	26.70	2.00	14.40	21.60	1.10	5.60	15.60	13.00	a
Inland (1992-1994)	24.10	2.40	23.50	16.40	0.70	5.10	16.30	11.50	a
Northeast	13.80	0.20	34.10	23.40	-0.30	9.80	11.40	8.10	a
North	16.60	1.50	47.70	8.20	1.20	2.30	9.60	12.90	a
Northwest	27.30	3.50	20.40	19.80	1.60	6.70	9.60	11.00	a
Central	17.80	-5.70	23.40	17.20	-0.10	7.20	22.40	17.90	a
East	6.20	3.30	42.40	15.00	1.40	7.00	7.20	17.50	a
South	28.70	2.20	3.90	21.40	1.40	6.90	23.80	11.80	a
Based on Total Living Expenditure:									
whole country (1985-1994)	7.46	1.37	3.08	7.56	0.25	3.43	5.85	6.06	34.90
Whole country(1992-1994)	6.50	1.41	6.87	6.14	0.20	2.22	5.40	4.80	33.53
Coast (1985-1994)	4.47	1.88	5.35	6.48	0.38	4.60	4.98	6.72	34.10
Coast(1992-1994)	4.68	1.45	6.32	7.02	-0.19	3.57	4.04	4.71	31.60
Inland (1985-1994)	9.35	0.70	5.04	7.56	0.39	1.96	5.46	4.55	34.95
Inland (1992-1994)	8.12	0.81	7.92	5.53	0.24	1.72	5.49	3.88	33.70
Northeast	5.42	0.08	13.40	9.20	-0.12	3.85	4.48	3.18	39.30
North	5.18	0.47	14.88	2.56	0.37	0.72	3.00	4.03	31.20
Northwest	9.69	1.24	7.24	7.03	0.57	2.38	3.41	3.91	35.53
Central	5.75	-1.84	7.56	5.55	-0.03	2.33	7.24	5.78	32.28
East	1.93	1.03	13.23	4.68	0.44	2.18	2.25	5.46	31.20
South	10.14	0.78	1.38	7.56	0.50	2.44	8.41	4.17	35.34

[a] Data are not applicable.

[b] MBS is referred as the MBS of 8 selected food group with respect to total living expenditure. They are computed through the linear regression with data consistent with different model specifications.

Table 32
Estimated Marginal Budget Shares of Meat & Grain Subgroups in the Second Stage

A: Meat Subgroup

Model	Pork	Beef	Mutton	Poultry	Eggs	Aquatic Products	Fre. Milk	Other Meats	MBS with respect to Total Living Expenditure (%)[a]
Based on the Selected Meat Subgroups:									
Whole country(1992-1994)	37.78	4.29	-9.11	24.11	3.61	37.27	1.51	0.55	[b]
Coast(1992-1994)	30.59	-1.99	-0.04	27.88	-6.46	45.37	3.17	1.48	[b]
Inland (1992-1994)	61.24	1.64	-12.12	21.31	9.30	14.65	2.30	1.69	[b]
Based on Total Living Expenditure:									
whole country (1985-1994)	2.60	0.29	-0.63	1.66	0.25	2.56	0.10	0.04	6.87
Coast(1992-1994)	1.93	-0.13	-0.01	1.76	-0.41	2.87	0.20	0.01	6.32
Inland(1992-1994)	4.85	0.13	-0.96	1.69	0.74	1.16	0.18	0.13	7.92

B: Grain Subgroup

Model	Rice	Sticky Rice	Standard Flour	Enriched Flour	Bread	Steam Buns	Other Fine Grain	Coarse Grain	
Based on the Grain Subgroup:									
Whole Country (1992-1994)	41.80	1.34	28.16	20.61	-3.60	4.56	6.74	3.78	[b]
Coast (1992-1994)	83.91	2.07	10.19	3.46	-3.82	-2.43	5.01	1.62	[b]
Inland (1992-1985)	21.84	1.00	29.70	26.85	-0.55	9.19	13.33	-1.37	[b]
Based on the Total Living Expenditure:									
Whole Country(1992-1994)	2.72	0.09	1.83	1.34	-0.23	0.29	0.44	0.02	6.50
Coast(1992-1994)	3.93	0.10	0.48	0.16	-0.17	-0.11	0.23	0.08	4.68
Inland (1992-1994)	1.77	0.08	2.41	2.18	-0.04	0.75	1.08	-0.11	8.12

a MBS of the subgroup with respect to total living are obtained form the corresponding items in Table 31.

[b] Data are not applicable.

In summary, the results from the first stage estimation show that consumers in the urban area would spend more on vegetables, spirits and beer, cigarettes, and fruits and melons when their income increases. Most food groups are price inelastic except for fruits and melons. Results from using data of more recent years (1992-1994) show that marginal budget share for meats is higher as compared with those using data for 1985-1994, suggesting that consumers in recent years spent additional income on meats. As for grain, even though, in quantity, the consumption of grains has decreased sharply during recent years, Chinese urban consumers will still allocate an important part of their increased income for grain (about 4.8 percent). As reflected by the expenditure elasticities, consumers in the coastal region tend to spend more on food items such as vegetable oil, spirits and beer, fruits and melons, and cigarettes, and less on grain as compared with those in the inland region. In addition, consumers in the coastal region are more responsive to changes in prices for most of food groups except sugar and spirits. The wide discrepancy in the estimated demand elasticities for six different regions confirms the existence of differences in food consumption behavior among regions.

In the second stage, results from the meat subgroup show that the demand for mutton, poultry, eggs, aquatic products, and fresh milk is price elastic. A decrease in meat price will induce a large increase in the demand for these meat products. The demand for pork is inelastic with respect to expenditure, and own price, implying that its importance in consumers' diets will decrease in the future. Poultry and aquatic products are price elastic, indicating that Chinese urban consumers will spend more on these two items when their income increases. The estimated marginal expenditure shares show that consumers in the coastal regional will spend most of their increased meat expenditure on aquatic products (45.37%), poultry (27.88%), and pork (30.59%), while those in the inland region will spent mostly on pork (61.24 %).

Surprisingly, most food items in the grain subgroups are price elastic except for bread, indicating that Chinese urban consumers are very sensitive to changes in grain prices in recent years. The expenditure elasticities for standard flour, enriched flour, and sticky rice are also greater than one indicating the potential for more consumption of these products when income increases. These results may be partly attributed to the shock of elimination of food rationing in 1993. The own-price and

expenditure elasticities for flour (both standard and enriched ones) are lower, and for rice is higher in the coastal region than in the inland region. As reflected by the marginal expenditure share, consumers in the coastal region will spend most of their increased grain expenditure on rice (about 84 percent), while those in inland area will spend much less on rice and more on flour.

Because the current CPPA demand matrix is only divided into rural and urban areas, it is appropriate to use the estimated elasticities from the whole country model to update the elasticity matrix for the urban region. Specifically, as reflected by the better R-squared values and test statistics of homogeneity and symmetry condition, the estimated elasticities from the whole country model for 1992 -1994 will be used in the later simulation. However, we strongly recommend replacing the regionalized elasticities if the CPPA-Mainland China is expanded to include a regional demand feature in the future, because, as we have observed, there are large differences in food consumption behavior among different regions.

CHAPTER VI

DESCRIPTION OF CPPA AND CPPA-CHINA MODEL

6.1 The General CPPA Model[4]

6.1.1 An Overview

The Country Projections and Policy Analysis (CPPA) model-builder is a simulation tool developed by the Economic Research Services (ERS) of U.S. Department of Agriculture (USDA). The system provides a means for developing and maintaining agricultural sector projection and simulation models for individual countries, using elasticities and other parameters available in the literature.

CPPA is a multiple-commodity, spreadsheet-based economic model of a country's agricultural sector. It has the advantages of being time-saving, theoretically consistent, and convenient for analyzing different scenarios.[5] The CPPA system is based on a series of SUPERCALC spreadsheets. Typically, there are three spreadsheets in the system, namely, a program spreadsheet, forecast spreadsheet, and the history spreadsheet. They are linked together to enable the contents of one spreadsheet to generate an action in another spreadsheet. *History and Program spreadsheets*

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[4]The introduction of General CPPA Model is based on a brochure released by the ERS/USDA, entitled "The Country Projections and Policy Analysis Model Builder, An overview of its uses and features" and "The CPPA Model-Builder, Technical Structure and Programmed Options in Version 1.3" by Kim Hjort, and Pierre Van Peteghem of ERS, August 1991.

[5]The advantages of the CPPA model are summarized by ERS in its brochure as: 1) a time-saving, programmed model-builder with equation-writer, consistency checks, and cross-commodity linkage; 2) a tool for generating rigorous, theoretically consistent annual, long-term projections of the supply, demand, and trade of major agricultural commodities; 3) a systematic framework for storing, transferring, and viewing data, projections, and externally estimated elasticities and parameters; 4) a quick and easy framework for analyzing alternative parameter assumptions; 5) a tool for conducting policy analysis or analyzing alternative scenarios; 6) self-documenting and easy to transfer from analyst to analyst; and 7) a system that enables the linking of individual country models to create price endogenous global models.

basically contain the historical production, supply, and disappearance (PSD) data for each of the commodities as well as historical land use and population data, and generates the *base value*[6] for future prediction. *The forecast spreadsheet* uses the base values and user-supplied elasticity-weighted percent changes in explanatory variables to generate production, demand, and trade projection in the specified future period. The *program spreadsheet* is not visible to the user, and acts as a *shell* controlling access to the forecast spreadsheet, and in some cases, to the history spreadsheet. *The Macro* written in program spreadsheet provides users with automated routines to conduct various tasks such as writing equations, and defining price linkages, etc.

6.1.2 The Structure of CPPA Model

The standard CPPA system operates on user-specified assumptions concerning international and domestic macroeconomic conditions, domestic agricultural and trade policies, and world price levels. When a country specific CPPA model is used, the small-country case will be assumed to exclude its impacts on the world price. Given exogenous variables and user-defined elasticities, domestic agricultural prices are projected. Price projections are combined with projection of other variables, such as population growth rates, to derive the supply and demand projections. For each commodity, prices are projected up to eight different levels: reference (world), border, import, export, open market producer, open market consumer, government procurement and subsidized consumer (to be defined more clearly later). Quantity variables are divided into six categories: production (for crops, i.e., the product of area and yield), consumption, beginning and ending stocks, imports, and exports. The standard CPPA system uses *imports* as residuals to ensure markets clear at the domestic prices, while the other five quantity variables are projected through structural forms. However, The procedure of generating trade projection may vary from country to country, and from commodity to commodity.

6.1.3 Definition of Economic Function

For each commodity, price and production, supply and distribution (PS&D) quantity set can be defined with the equation writer. A linear or Cobb-Douglas function is used to do the projection.

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[6]The base values represent normal levels of production, demand, and trade in the base year. In our projections, the year 1996 is the base year.

In each equation, up to nine explanatory variables can be included. In addition, CPPA possesses the capability of varying the parameter on one explanatory variable such as income elasticity.

6.1.4 Linkage between Livestock and Feed

Firstly, the production of livestock products such as beef, pork, and poultry is projected in CPPA. Secondly, these figures are adjusted to reflect the *commercialization rates*, that is, the percentage of one specific livestock that is fed with feed purchased from market vs fed with "junk" food in a farmer's backyard. Thirdly, after being multiplied by energy and protein feed conversion ratio, the aggregate energy and feed requirements are derived. Finally, the aggregates are distributed among grains and oilseed meals based on economic relationships which portray the substitutability among grains and meals.

6.1.5 Inputs Requirement

CPPA requires the inputs of basic data and information governing economic interrelationships. Based on the different inputs of data, such as the growth rate of population or urbanization rate, scenario analysis can be carried out. Specifically, required inputs are (ERS, 1994) :

1) projection of real income, population growth, world prices, and other exogenous data;
2) specification of linkages between world and domestic prices;
3) specification of policy parameters such as import tariffs;
4) supply and demand elasticities, such as own and cross-price, and income elasticities;
5) technical coefficients such as feed conversion coefficients; and
6) base value- calibrated starting points from which the projections are generated.

6.2 The CPPA-China Model[7]

When the CPPA-China model is not operating as part of ERS's linked modeling system which solves for endogenous world prices, China takes world prices as given. In this sense, it assumes the "small country case". Currently all prices in China are determined by both world prices and domestic market conditions.

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[7]This part is based on " The Economic Research Service Model of Chinese Agriculture", by Mark Giordano, 1994, the model adjustments made by author, and author's own understanding.

The present CPPA-China model produces annual projections of price and quantity variables for each of 39 commodities (Table 33) for next 10 years. Historic price, macro and policy data used in the model are derived from multiple sources, while quantity data are from ERS's Production, Supply, and Distribution data base (Giordano, 1994).

Table 33
Commodity Coverage In the CPPA-China Model

Beef	Cotton	Sesame Meal
Milk	Sugar	Cotton Seed Meal
Pork	Soybeans	Fish Meal
Mutton	Groundnuts	"Other" meal
Fish	Sunflower Seed	Soy Oil
Poultry	Rape Seed	Groundnut Oil
Eggs	Sesame	Sunflower Oil
Wheat	Cotton Seed	Rape Oil
Rice	"other" oilseed	Sesame Oil
Corn	Soy Meal	Cotton Seed Oil
Sorghum	Groundnut Meal	Palm Oil
Barley	Sunflower Meal	"other" Oil

6.2.1 Prices

When the CPPA-China model operates independently, the exogenous forecast of global commodity prices are given. Currently, all domestic prices are determined as functions of either world prices and domestic market conditions or solely by domestic market conditions. All prices are calculated in real terms with 1990 as the base year.

1) Reference (World) Prices

Currently, the reference prices are defined as dollar prices in the U.S. market.

2) Border Prices

The Border prices of commodities are defined as Yuan prices and they are computed by: Border price = Real Exchange Rate * (Reference Price + Transportation Costs).

Due to the lack of data, CPPA-China assumes that the transportation costs for all commodities are the same.

3) Import prices

Import prices are defined as the prices of imported goods moved from the border into the Chinese market and include all trade barriers. They are calculated as:

Import Price=Border Price * (1+Ad Valorem Tariff Rate Equivalent).

Also due to the lack of full knowledge about tariff rates in China, the current CPPA-China model sets a constant ad valorem Tariff for commodities: 50 percent for beef, milk, pork, poultry, and eggs; zero percent for fish, wheat, rice, and corn; 3 percent for cotton; 30 percent for sugar; and 4 percent for soybeans. The updating of information of tariff practices in China is important especially for the producer prices which are determined completely or partially by world prices.

4) Export Prices

Export prices are defined as the prices of exported commodities moved from the Chinese market to the border and include any export taxes or subsidies. Export prices are defined as :

Export Price=Producer Price * (1 + Ad Valorem Export Tax).

Currently, all the ad valorem export tax for all above commodities are set to zero in the model.

5) Producer prices

Producer prices are defined as the prices received by farmers. They are modeled in two ways: I) producer prices of some commodities are defined as functions of domestic conditions. In this case, all the quantity variables are projected through a functional relationship (as opposed to leaving one such as import and export as a residual, the model will iterate until the producer price is found to balance the demand and supply). Projection of most meat commodities such as pork, milk, eggs, and poultry are falling into this category. It is implicitly assumed for these commodities that the domestic markets are completely separated from international market. ii) some producers prices are modeled as a function of both domestic and world price levels, and they are specified in the Cobb-Douglas form using import or export prices along with lagged production and consumption as explanatory variables. Wheat and corn are modeled in this way.

6) Consumer Prices

Consumer prices are defined as the prices paid by retail consumers and are simply specified as:

Consumer price = Producer price * (1+ Consumer to Producer Price Margin).

The current model assumes that the consumer to producer price margin in the base year holds for the future.

7) Government Producer Price (Procurement Price)

Government Producer Price is defined as the price paid by government to farmers for direct government procurement for commodities such as grain. Prices are set to change at the same percentage rate as the producer prices.

8) Government Consumption Prices

Government Consumption Prices are defined as the prices charged to consumers for commodities sold through government channels, especially for the commodities which are subsidized. In the current model, all purchases are assumed to be made at consumer prices.

6.2.2 Production

1) Meat and Meat-related Commodities

Cobb-Douglas functions are used to project meat production in the next ten years. Various variables such as total demand for specific meat product, producer prices, consumer prices of various kinds of feed are used in the projection. They vary for each specific commodity.

2) Crops

As mentioned earlier, the CPPA-China model divides China into six agricultural regions to capture the differences in agricultural resources. The production of each region is estimated separately, and the summation of regional production gives the national total. In each region, the production of a specific crop is estimated as the product of *expected yield* and *expected harvested area* for the crop. *Expected yield* may be affected by many factors such as short term input and output, the price of labor, long term investment in research and education, environmental and climatic factor, etc. The CPPA-China model uses a simplified framework, projecting the expected yield as a function of output prices and trend elasticities. As mentioned earlier, China still has large potential to increase the yield. Different yield assumptions can be made to generate the scenario projection.

One uniqueness in the CPPA model is its determination process of the allocation of arable land and total harvested area. Area is modeled in a multi-stage framework. Though the aggregate stock of land is fixed, the allocation of land for agricultural and non agricultural uses, as well as the distribution of agricultural land among different crops may vary subject to lots of factors. In the first stage, a trend variable is used to project the land distributed to agricultural uses in each region. Then, *the cropped arable land,* i.e. the number of hectares available per year to grow crops, is calculated as the product of the land distributed to the agriculture and the *cropping intensity index*, which can be treated as number of times a given physical quantity of land is used in one year. In stage two, farmers in aggregate are assumed to be the rational utility maximizers. Total cropped arable land is distributed to commodities as wheat, indica and japonica rice, sugar, cotton, coarse grain group, oil grain group, and other crops. The process is modeled with Cobb-Douglas function of the crop's own and its competitors' *expected return,* and total cropped land. The expected return is calculated with the following functional form:

$$ER_{it} = (GP_{it-1} * PCTPRC_{it-1} + PP_{it-1} * (1-PCTPRC_{it-1})) * EXYIELD_{it}$$

where:

I = specific region,

t = the current year,

ER = Expected return,

GP = Government procurement price,

PCTPRC= Percent of crop procured by the government,

PP = Open market producer price,

PR= Production,

EXYIELD= Expected yield,

The estimation of expected return implies that both the government procurement price and market producer price affect marginal planting decisions. All the expected return elasticities are estimated by the ERS of USDA. Besides, due to the limitation of data and study in the cost side, input costs are not considered in estimating the land distribution (Giodano). In the third stage, once the total cropped arable area allocated to total coarse grain and oilseed is determined, the area devoted

to specific individual coarse grains and oilseeds is calculated using base period production share and a trend parameter. Corn and soybean are chosen as residuals to balance the both groups.

6.2.3 Demand

Unlike the regional breakdown as conducted in the supply side, the demand for direct food consumption is divided into two parts: rural and urban.[8] The demand for meat commodities such as beef, pork, fish, egg, etc is calculated as the product of urban (or rural) population and urban (or rural) per capita food consumption for various meat items. The per capita demand for a specific meat commodity is modeled in Cobb-Douglas form with variables such as its own price, prices of its main substitutes, and per capita total expenditure on food group (such as meat) as well as per capita GDP, a proxy of living income.

The demand for crops may consist of direct food consumption demand, feed grain demand, demand for spirit, demand for crop seeds, demand for drought animal, as well as grain damage & manufacture use. Given the scope of the present study, the current CPPA-China only focuses on the first two items which are believed to account for most demand for crops. The estimation of demand for crops for direct food consumption is carried out in the same pattern as for meat commodities mentioned above.

Feed demand is projected by the total energy and protein feed demand, which is in turn determined by the projected total production of animal products, as mentioned earlier. ERS estimated the type-specific feed conversion coefficient. The energy requirement for each meat type is then summed to determine total energy feed demand. The similar process is used with the feed-protein conversion coefficients to capture the total protein feed demand. While wheat-for-feed demand is estimated as a function of its price, the price of corn and total energy feed demand, rice-for-feed demand is determined as a residual in the rice block, and total coarse grain feed demand is determined as the residual energy feed source by subtracting the estimates of wheat and rice feed demand from the total energy feed demand estimates. Similarly, soy meal demand is calculated as the residual protein feed source, while other protein sources such as groundnut, sunflower, rapeseed, cottonseed, and fish are projected.

. [8]ERS is planning to regionalize the direct food consumption by 6 regions.

One of the major tasks of this thesis is to update the demand side of CPPA-China. We will substitute the demand elasticities derived from the first part of our study as well as elasticities available from the literature for the those currently used in the demand matrices of the model, most of which are assumed without strict verification. In this way, we can provide a theoretically consistent projection of food consumption for the next 10 years. Our projection will focus on those commodities for which the demand elasticities have been estimated in the first part of the thesis. As the supply side is not the major concern of this thesis, we will either keep the present structure untouched, or make only minor changes, although much improvement in this area is quite necessary.

6.2.4 Beginning Stocks and Ending Stocks

Due to the lacking of reliable information on stock holding in China, the modeling of stock also takes a very simplistic method, i.e., for grain, cotton, and sugar, ending stock level is computed as a percentage of demand.

6.2.5 Trade (Import or Export)

Trade is also modeled in two ways. For those commodities where trade is either an important factor in domestic market conditions or may have the potential to be very important, trade is modeled as a market balance residual, i.e. as an excess supply or demand function. Commodities such as wheat, corn, sugar, soybean, etc are modeled this way. As the CPPA-China model is used independently, the model assumes the "small country" case, and , thus, the impact of China's trade on world price is neglected.

For other commodities, their trading volumes presently make up only a small fraction of production and/or consumption, and considered not to become an important factor within the model's projection period, and therefore, they are projected with a functional relationship. Most animal products fall into this category.

6.3 Evaluation of the CPPA-China Model

From our extensive application of the CPPA-China model, we conclude that the it is a useful and convenient tool for simulating a country's agricultural sector. We have observed and appreciated many advantages as mentioned earlier in the thesis. Here, we will focus on the weaknesses of the model and its possible improvement.. Some of the problems are not necessarily related to the structure of model itself, but rather the difficulties we encountered in using it.

1) The CPPA-China model is built on spreadsheets, using a large amount of memory. Sometimes it takes a long time to generate projections. In our application, the model is installed in an IBM 486 computer. We had to expand the RAM to 16 MB to make full use of all useful components in the model. Even with this expansion, it still takes an average of 40 minutes to generate one complete projection.

2) When a country model like the CPPA-China is used independently, the model cannot capture its impact on the world market. It is not entirely appropriate to justify this "small country" assumption for a large country such as China.

3) It is difficult to track down the exact causes for the operational failure in projection. When we updated the elasticity matrix with our estimates without any modification, the model could not converge, giving all error messages. Sometimes, we have to try many times to adjust the parameters like demand elasticities before we can obtain a reasonable projection.

4) Due to the sensitivity of the model, for those products whose trade volumes only account for a very small proportion of total production, trade can not be used as the residual to balance the market. Otherwise, the model will generate some unreasonable results in projection. In this case, we model the trade with a functional form.

5) Due to the unavailability of some essential and well-verified information or data, the current CPPA-China model embodied many assumptions which may lead to bias in projection. For example, the exogenous world prices for agricultural products used in the projection need to be studied more carefully and should be timely updated, because they will certainly affect the domestic price as well as the production and consumption projections. All the parameters used to project the domestic prices are also assumed without a strict validation. Most microeconomic data including GDP, population, and foreign exchange rates should be further studied and updated.

6) On the demand side, although the current CPPA-China model has the ability to simulate the per capita and aggregate food consumption separately for the urban and rural regions, in actual practice, all the parameters were assumed to be the same for these two regions. That is, all the per capita consumption of various food items and demand elasticities were the same for urban and rural regions. In our simulation analysis, we made an effort to distinguish and update the elasticity matrices and data of per capita consumption with either our estimates or the latest information.

With respect to elasticity matrices, we updated them with our estimates and those available in the literature. As mentioned earlier, we had to somehow adjust the elasticities in order to avoid the failure of the model to convergency. For example, we lowered the own-price elasticities for both rice and wheat, otherwise, the model did not converge. In practice, the own price and income elasticities were updated. Based on the base year budget share, assumed substitutability, and theoretical properties of demand theory, the current formulation of elasticity matrices in the CPPA-China model can compute the cross price elasticities automatically. It is difficult to adjust these cross price elasticities in the model. Adjustments were only made on the occasions when we felt that it is absolutely necessary. Taking meats and grain as example, our econometric results from all the model specifications show that they are complements rather than substitutes. We made the correction in the model.

Regarding the data on per capita consumption of agricultural products, we sometimes can not find the relevant data, and in some cases, we felt that the applicability of data in the model was doubtful. Some studies have already indicated that if we use the official per capita consumption of a specific product multiplied by the total population to derive the total consumption of the product, we may find the derived figure far less than the official production figure. Some scholars suggested that food consumed in the service industry may not be covered in the household surveys. This may also be the reason why the per capita consumption data used in the current CPPA-China model are much larger for some products such as pork than those published in the China Statistical Yearbook. This discrepancy raised another serious problem when we attempted to distinguish and update the starting value of per capita consumption for the urban and rural regions. Restricted by the lack of reliable data sources, we could only differentiate and updated the per capita consumption data for rice and wheat in two regions. For the rest products, per capita consumption data were intact. We once attempted to use the official per capita consumption data for pork from Statistical Yearbook of China as the starting value in projection, but the model failed to converge.

Despite these weaknesses and difficulties, the model still provides an excellent tool to simulate a country's agricultural sector. Many nice features such as handy reference to historical data, and convenient equation writer greatly facilitate simulation process for researchers.

CHAPTER VII

SIMULATION OF AGRICULTURAL PRODUCTION, CONSUMPTION AND TRADE IN MAINLAND CHINA, 1996-2005

In this chapter, we will develop several scenarios to simulate the Chinese agricultural production, food consumption, and trade for the next ten years. The simulation results are presented and evaluated.

7.1 Major Assumptions

7.1.1 Macroeconomic Variables

In our projection, we make the following assumptions:

1) Due to the complexity in modeling, we adopt the small country case for Mainland China. Therefore, Chinese agricultural production, consumption, and trade will not have any impact on the world market.

2) The real exchange rate is assumed to increase very slowly from 5.464 (one US$ equals to 5.464 Yuan) to 5.615 in 2005.

3) GDP growth rate in Mainland China is assumed to decrease from 9.6 percent to 7.4 percent with the annual decreasing rate of about 2.4 percent. Per Capita GDP will increase at the annual rate of 7 percent.

4) Mainland China is assumed to continue its current declining trend of total agricultural land under the pressure from the booming non-agricultural industry. Correspondingly, Mainland China is assumed to continue losing cultivated area, but at a gradually decreasing rate. Total arable land will decrease at an average rate of 0.183 percent from 94.7 million hectare in 1996 to 93.0 million hectare in 2005.

5) In the baseline , the Chinese population will continue to increase but also at a declining rate with an average of 0.8 percent increase per year, from 1.215 billion in 1996 to 1.328 billion in 2005. From 1995 to 1996, the population is projected to increase about 12.5 million, but during 2004-2005, the population is expected to increase only 9 million per year, as a result of birth control policy. The percentage of urban population will increase from 28.6 percent in 1996 to 31.0 percent in 2005 with an average growth rate of 0.7 percent per year. The urban population is expected to reach 411 million in 2005.

6) In our projection, Mainland China is not expected to import a large amount of meat products in the future. Present trade policy certainly not favor any large meat imports. Furthermore, a rapid increase in capacity for handling, storing, and transporting a large amount of meat products at all importing channels is not possible, because the transport of meat products is much more difficult and costly than the bulk commodities such as wheat and corn. We will assume that with its abundant labor force as well as appropriate policy incentives, meat production in Mainland China will be able to keep pace with its domestic meat demand. Nevertheless Mainland China is expected to import a large amount of feed products to meet the increasing demand for livestock products. The meat trade may increase in the future, but not to a large extent.

7.1.2 Elasticity Matrix

As conducted in the first part of this study, the food demand decisions are assumed to be made through a two-stage budgeting process. In the first stage, consumers decide the consumption quantity of each major commodity group, e.g., meat and grain, based on income and the prices of the commodity groups. Once first stage decisions have been made, consumers, in the second stage, decide on the consumption quantity of each individual commodity within a group.

Currently, the demand matrix is divided into urban and rural regions in the CAAP-China model. In general, we update the estimates with those obtained in this study for the urban section of the demand matrix. However, modifications have been made for two purposes. The first is to avoid a drastic distortion of the demand projection. As discussed in the first part of the study, the decreases in the major grain consumption observed in recent years may have been caused by the price factors as indicated by the large price elasticities. The impact of price effects more than offset that of expenditure effects which are also very high, contributing to the observed decreases in grain

Table 34

Assumed Yield Growth Rates in Different Scenarios[a]

	Assumed Annual Growth Rates		
Crops	Scenario 1	Scenario 2	Scenario 3
Wheat	1.8 (4.09 tons/ha)	1.3 (3.89 tons/ha)	2.1 (4.20 tons/ha)
Rice	1.6 (4.87 tons/ha)	1.1 (4.63 tons/ha)	1.9 (5.01 tons/ha)
Corn	2.0 (5.78 tons/ha)	1.4 (5.45 tons/ha)	2.3 (5.96 tons/ha)
Other Crops	2.0	1.4	2.3

[a] Figures in parenthesis are estimated yield in 2005. The rice yield is measured in terms of milled rice.

7.2.2 Varying Urbanization Rates

As indicated earlier, the vast differences in food consumption behavior exist between urban and rural consumers. Urban consumers consume much more meat products and much less food grains. Thus, the undergoing movement of rapid urbanization will certainly impose its influence on food consumption, production, and trade.

Subsequently, we also design a scenario for analyzing the impacts of the different urbanization rates (the percentage of non-agricultural population in the total) on the agricultural sector. We choose Scenario 1 as the base case, in which the percentage of urban population is assumed to increase from 28.6 percent in 1996 to 31.0 percent in 2005 with the average growth rate of 0.7 percent, and the urban population will reach 411 million in 2005.In scenario 4, we assume that the urbanization rate will increase at a higher rate of 1.8 percent per annum. Thus, the urban population will reach 474 million by 2005, accounting for 35.7 percent of the total population. The percentage of urban population will rise by 7.1 percent per year.

7.2.3 Varying Income

Since food demand is highly dependent upon income growth, it is appropriate to investigate the effects of varying income on the projected food supply/demand balance in Mainland China. Therefore, we specify another scenario to show these impacts. Specifically, in Scenario 5, we assume

accounts for about 45 percent of the arable land (An, 1995). Rapid expansion of the irrigation system requires substantial investment which is almost impossible to come from domestic sources because of the current monetary austerity policies. Effects of projects funded by multi-country agreements or international organizations are more localized and scattered. The degrading of the agricultural ecology through such effects as severe salinization, soil erosion, and lower ground water level will further retard the grain production growth.

The potential for improving agricultural production lies largely in upgrading current agricultural technology, which provides high yield varieties of seeds, multiple cropping, and improvement of farmer's skill. As mentioned earlier, most crops in Mainland China still have much room to improve their yield as compared with the levels achieved in other countries.

Wheat yields have increased at an annual rate of 1.91 percent per year from 1985 to 1993 (Crook, 1994), reaching 3.52 tons per hectare in 1993, which is far below the level of 5.99 tons by Holland. The rice yield has increased at an annual rate of 1.4 percent during the same period, reaching 5.86 tons (unprocessed) per hectare in 1993, which is also far below the 8.34 tons in Australia. For corn, the yield has increased at the rate of 3.87 percent in the period from 1985 to 1993 (Crook, 1995).

Since crop yields are the key factors affecting agricultural productions in Mainland China, we will specify our first scenario analysis based on different growth rates in yields, as shown in Table 34, to simulate the production, consumption, and trade for the next ten years, from 1996 to 2005. In Scenario 1, we assume that the current yield growth rate will be sustained except for corn. The yield growth rate for corn is adjusted to reflect the diminishing marginal productivity as yield further increases. Scenario 2 simulates the projection when the yield growth rate is lower, representing the occasion on which the government inputs in agriculture, agricultural research, education, and extension do not improve as much as in Scenario 1 during the projection period. Scenario 3 simulates the higher yield growth rate, reflecting a better environment for agricultural production.

consumption in recent years. This situation may have been a result of the elimination of food rationing policy in 1993, which led to surges in grain prices. In the long run, we assume that the grain price will increase at a slower rate, which will result in lower price effects. The second purpose is for preventing the model from failing to converge. As mentioned earlier, an exact adoption of the estimated high price and expenditure elasticities yielded an explosion of the model. We assumed somewhat lower price and expenditure elasticities for the simulation. In addition, we assume that the expenditure elasticities for major grain products will continue to decline in the future.

As to the demand elasticities matrix for the rural region, a very disaggregated study of food demand is not available in the literature. We use the estimates available for the first stage in the literature, mainly based on Fan et al.'s study (1994). One should note that the income elasticities for the meat group are much larger than that in the urban region, which will result in higher meat consumption in the rural region in the future. This is a reasonable assumption from the point of the low consumption of meat products in rural area at the present stage. For the meat demand matrix, we will use the same elasticities as used for the urban region with the assumption that the consumption behavior of meat (among different meat products) will become more similar to the urban residents as the Chinese consumer market further develops, and there will not be much difference in taste or preference between rural and urban residents.

The demand elasticity matrixes used in the simulations are shown in Appendix C. As one can see, only a very few cases, the homogeneity condition is not held due to the convergency problem.

7.2 Scenarios

7.2.1 Varying Growth Rates of Crop Yields

On the production side, the main factors affecting agricultural production, especially grain are land and water endowments, material inputs, agricultural technology, macro-economic and agricultural policies, and institutional factors (An, 1995). As indicated in Chapter II, the declining trend of arable land tends to be irreversible, but it may decrease at a reduced speed as part of the government effort to maintain sufficient agricultural output. We assume that the total arable land will decrease at the annual rate of 0.183 percent up to the year 2005.

Chinese agriculture has long been plagued by water scarcity, especially in the North and Northwest regions. Irrigation acreage in Mainland China remains at about 45 million hectares and

that per capita GDP will increase at the annual rate of 10 percent in stead of 7 percent assumed under the Base Case. All other assumptions are as the same as those in Scenario 1.

7.3 Simulation Results[1]

Table 35 presents the results of simulations based on the different expected yield growth rates for major crops. In Scenario 1, the total grain production will increase at the average annual rate of 2 percent during the simulation period, reaching 424 million tons in 2005. The total grain consumption will increase at the rate of 2.5 percent. Net grain imports will reach 38.3 million tons, which is more than twice as much as the highest import volume in history. Wheat production will grow faster than rice production due to the increasing plantation area for wheat, while the projected growth rate in consumption is also higher for wheat, resulting from the higher propensity to consume more wheat products in the nation. The increase in rice consumption is mostly contributed by the increase in population. Corn production will increase faster than any other crops, yielding to the pressure from the livestock industry with an average growth rate of 3.5 percent. Corn consumption will increase rapidly with a 4.7 percent growth rate. Wheat import will account for 35 percent of total grain import, while corn import for 53.4 percent. Our projections show that Mainland China will import and, in the meantime, export both rice and corn. By 2005, there will be a net export of rice (0.18 million tons) and a net import of corn (20.8 million tons). In the case of corn, this occurs as a result of regional disparity in the production and consumption of corn. As for rice, Mainland China has been exporting high quality rice and importing lower quality rice.

With respect to meat products, production is assumed to be able to keep pace with the demand increase in our model formulation. Pork and poultry consumption will increase at the annual rates of 5.6 and 8.8 percent, respectively. The high growth rate of pork consumption is mainly caused by the rapid demand increase in the rural region.

In Scenario 2, the grain production will increase at a lower average annual rate of 1.6 percent per annum as compared with Scenario 1. The total consumption growth will also be lower as a result of the lower production growth. Net grain import will be 7.6 million tons higher than that projected in Scenario 1 by 2005 (Figure 11). Wheat and corn import will be also about 1 and 5

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[9]The computer outputs for projecting selected agricultural products in Scenarios 1 and 5 are presented in Appendix D.

million tons higher than those in Scenario 1, and wheat and corn will account for 32 and 55.4 percent of total grain import. The production and consumption of meat products do not change much.

Scenario 3 represents higher growth rates in crop yield than the base scenario. The projected average grain production growth of 2.3 percent, is about 11 million tons higher than that projected in Scenario 1 by 2005 (Figure 10). Total consumption will also be higher by about 4 million tons. Net grain imports will be about 4.8 million lower than the projected figure in Scenario 1 (Figure 11), mainly due to the low growth in wheat import. Actually, if this growth rate is sustained in the future, the wheat import volume will remain at the present volume. Corn production will be more than 4 million tons than that projected in Scenario 1. However, corn import will still be only 1.5 million lower by 2005, accounting for more than half of total grain import. The production and consumption of meat products will also increase faster due to the higher yields for crops.

Table 36 compares the results between Scenarios 1 and 4 for different urbanization assumptions. Total grain consumption under Scenario 4 is 5.5 million tons less, and total grain import is 2.6 million tons less than those projected in Scenario 1. The decrease in wheat consumption of about 3.5 million tons can be attributed to the decrease in total grain consumption. Wheat imports will not increase as a direct result of more rapid urbanization, because urban residents consume much less wheat than rural residents. Correspondingly, rice consumption will also be 2.2 million tons lower in Scenario 4. Because we failed to input the different figures of per capita consumption of meat products for the urban and rural regions in the model, corn consumption and import by 2005 increase only slightly as compared with the projections in Scenario 1. Similarly, the consumption and production of pork and poultry are only slightly higher those projected in Scenario 1. we expect that there will be much higher demand for meat products and corn as a result of higher urbanization rate, if the differentiated per capita consumption data are used in the model.

The impacts of varying income growth on food demand/supply balance are shown in Table 37. In Scenario 5, the projected net import demand for grain is 61.0 million tons in 2005 of which 19.2 million tons is for wheat and 38.3 million tons for corn. Clearly higher income will increase the demand for both food grain and feed grain.

In summary, these projections show that Mainland China will increase its grain imports in the future, even in Scenario 3 in which Chinese agricultural production will be improved substantially.

Feed grain, especially corn will account for more than 50 percent of total grain import. The rapid increase in grain imports is a direct result of the projected rapid increase in meat consumption and production. Mainland China will be a major grain importer in the future. The undergoing urbanization movement will slightly ease the grain shortage in the future, especially for wheat, but it will cause more consumption of meat products. The feed grain market will still be under a lot of pressure. However, we should be aware of the small country assumption when we run the CAAP-China model independently. When Mainland China imports about 40 million tons of grains in the world market, the grain prices will most likely be driven up by this huge import demand. Given the high price elasticities of grains obtained from this study, Mainland China will be expected to import less grains. In this sense, the projections from this study can be treated as the upper bound of the projected trade volume in the future.

The simulation results from this study should not be used as future prediction, because many factors in the CPPA-China model are not strictly tested. Many essential data are not available . The model is very sensitive to demand elasticities. As mentioned earlier, the detailed disaggregated study for food demand estimation in the rural region is not available. For those in the urban region, the accuracy of demand elasticities may also be affected by the shock of recent elimination of food rationing policy and high inflation rate. It is necessary to update these elasticities when more data after the 1993 elimination of food rationing are available. There is even more room for improvement on the supply side. Knowledge about future price projection, the supply response, and the relationships among consumption, production, import, export, and beginning stock and ending stock should be further expanded and incorporated into the model.

Table 35
Simulation Results for Major Agricultural Products
Based on Different Yield Growth Rates

Item	Year 2000 (1,000,000 tons)			Year 2005 (1,000,000 tons)			Annual Growth Rate (1996-2005) (%)		
	Scenario			Scenario			Scenario		
	1	2	3	1	2	3	1	2	3
Total grain production[a]	379.2	370.7	383.6	424.7	405.8	435.7	2.0	1.6	2.3
Total grain consumption	414.2	396.7	403.3	460.3	449.7	464.5	2.5	2.3	2.6
Total grain import	23.7	26.6	21.8	40.8	48.1	36.3	9.2	11.0	7.9
Total grain export	2.1	2.0	2.2	2.5	2.1	2.8	2.5	0.5	3.8
Net grain import	21.6	24.7	19.7	38.3	45.9	33.5	11.0	13.2	9.4
Wheat production	103.4	101.4	104.5	115.8	110.4	118.2	1.6	1.1	1.8
Wheat consumption	114.3	113.0	114.3	130.0	126.2	129.5	2.1	1.8	2.0
Wheat import	10.9	11.5	9.8	14.4	15.9	11.4	1.9	2.9	-0.5
Rice production	133.4	129.9	135.1	142.1	135.0	146.1	1.1	0.6	1.4
Rice consumption	134.1	131.2	135.0	138.9	132.7	140.7	0.8	0.3	0.9
Rice import	1.04	1.04	1.04	1.27	1.28	1.27	3.8	3.8	3.7
Rice export	.77	.68	.83	1.45	1.11	1.70	13.8	10.8	15.6
Corn production	127.8	125.1	129.4	151.7	145.6	156.0	3.5	3.0	3.7
Corn consumption	135.5	135.8	136.1	172.3	172.0	175.0	4.7	4.7	4.8
Corn import	9.4	10.4	8.6	21.8	26.6	20.3	27	48.8	26.1
corn export	1.2	1.2	1.2	1.0	0.95	1.01	-4.0	-4.4	-3.9
Pork production	53.3	53.4	53.8	70.3	70.8	71.9	5.6	5.7	5.8
Pork consumption	53.1	53.1	53.5	70.1	70.5	71.5	5.6	5.7	5.8
Pork Export	0.28	0.31	0.31	0.26	0.37	0.37	1.6	5.1	5.4
Poultry production	13.1	13.2	13.4	19.9	20.4	20.9	8.6	8.8	9.1
Poultry consumption	13.5	13.1	13.3	20.1	20.5	21.0	8.8	9.1	9.3

[a] Grain production does not include soybeans and potato products.

Table 36
Simulation Results for Major Agricultural Products
Based on Different Urbanization Rates

Item	Year 2000 (1,000,000 tons)		Year 2005 (1,000,000 tons)		Annual Growth Rate (1996-2005) (%)	
	Scenario		Scenario		Scenario	
	1	4	1	4	1	4
Total grain production[a]	379.2	378.5	424.7	423.5	2.0	2.0
Total grain consumption	414.2	398.9	460.3	454.9	2.5	2.4
Total grain import	23.7	22.5	40.8	38.2	9.2	8.4
Total grain export	2.1	2.1	2.5	2.5	2.5	2.5
Net grain import	21.6	20.4	38.3	35.7	11.0	10.1
Wheat production	103.4	103.0	115.8	114.7	1.6	1.5
Wheat consumption	114.3	112.7	130.0	126.5	2.1	1.8
Wheat import	10.9	9.7	14.4	11.9	1.9	-0.1
Rice production	133.4	133.0	142.1	141.6	1.1	1.1
Rice consumption	134.1	132.8	138.9	136.6	0.8	0.6
Rice import	1.04	1.04	1.27	1.27	3.8	3.7
Rice export	.77	.76	1.45	1.4	13.8	13.6
Corn production	127.8	128.0	151.7	152.0	3.5	3.5
Corn consumption	135.5	135.6	172.3	172.5	4.7	4.7
Corn import	9.4	9.4	21.8	21.7	27.0	26.9
Corn export	1.2	1.2	1.0	1.0	-4.0	-4.0
Pork production	53.3	53.5	70.3	70.8	5.6	5.7
Pork consumption	53.1	53.2	70.1	70.4	5.6	5.7
Pork Export	0.28	0.32	0.26	0.38	1.6	5.5
Poultry production	13.1	13.3	19.9	20.5	8.6	8.9
Poultry consumption	13.5	13.2	20.1	20.6	8.8	9.1

[a] Grain production does not include soybeans and potato products.

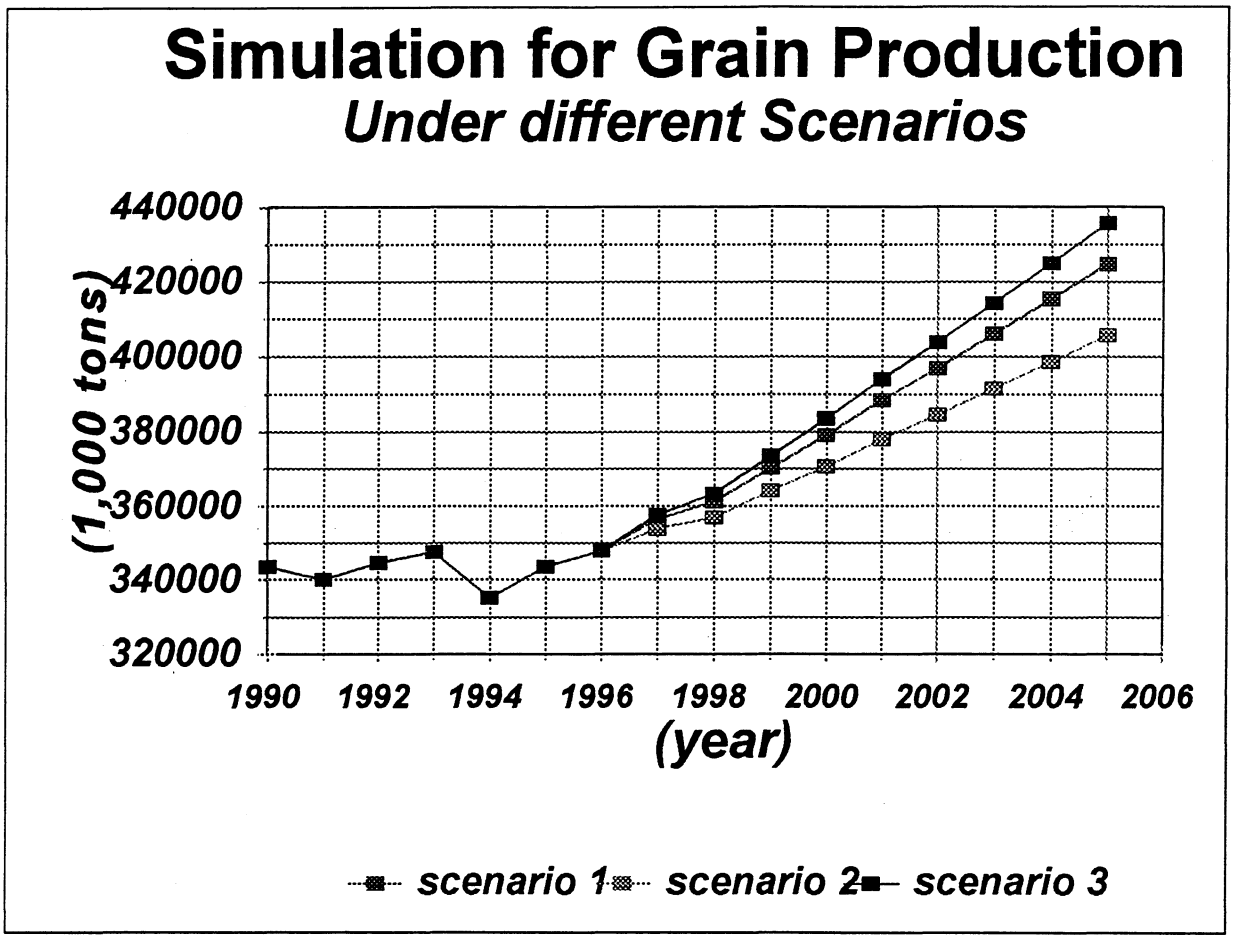


Figure 10. Simulation for Grain Production

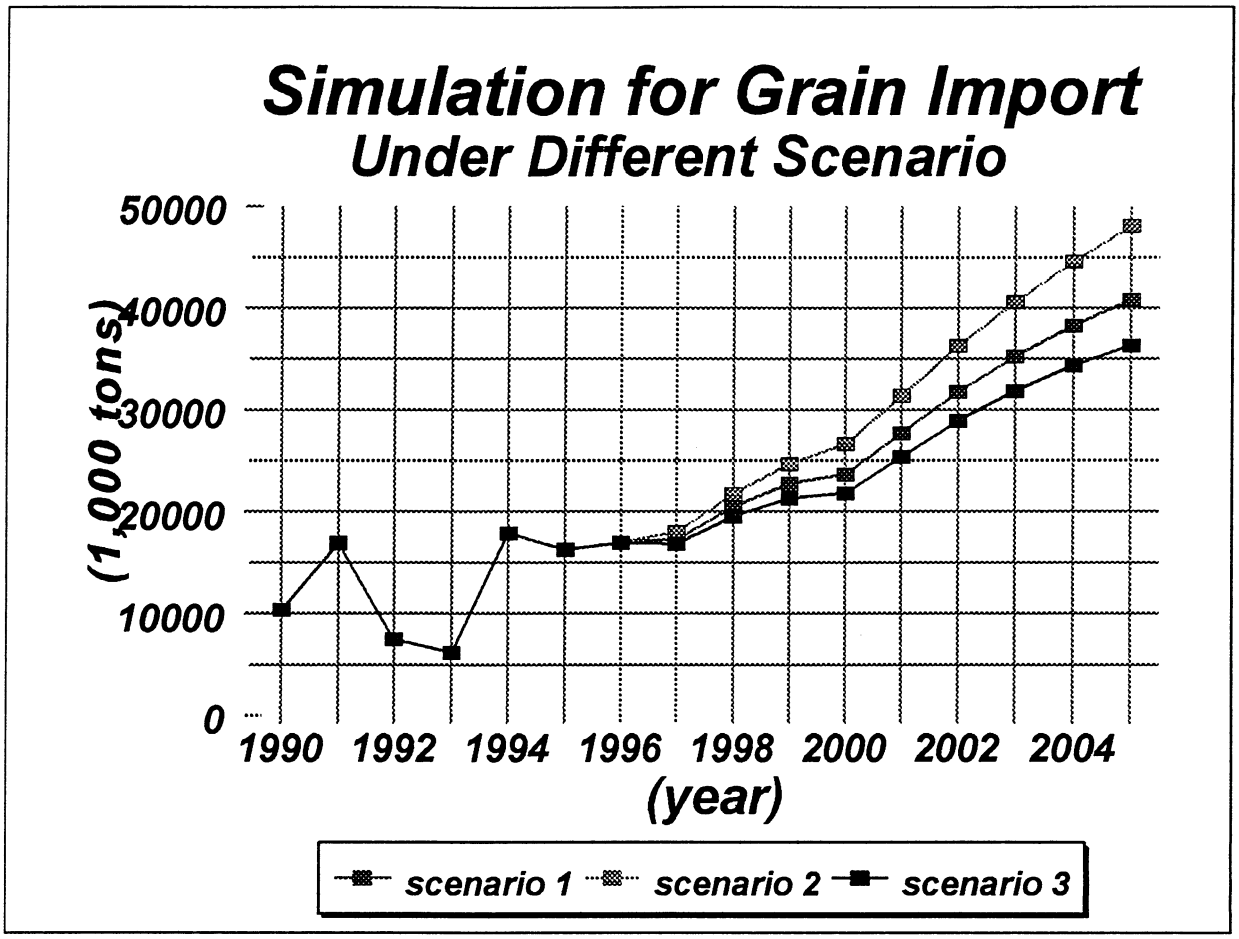


Figure 11. Simulation for Grain Import

Table 37

Simulation Results for Major Agricultural Products Based on Different Income Growth Rates

Item	Year 2000 (million tons)		Year 2005 (million tons)		Annual Growth Rate (%), 1996-2005	
	Scenario		Scenario		Scenario	
	1	5	1	5	1	5
Total grain production[a]	379.2	381.2	424.7	433.9	2.0	2.2
Total grain consumption	414.2	409.5	460.3	493.6	2.5	3.2
Total grain import	23.7	29.1	40.8	63.5	9.2	14.1
Total grain export	2.1	2.1	2.5	2.5	2.5	2.5
Net grain import	21.6	27.0	38.3	61.0	11.0	16.9
Wheat production	103.7	103.7	115.8	116.5	1.6	1.6
Wheat consumption	114.3	115.9	130.0	135.4	2.1	2.5
Wheat import	10.9	12.4	14.4	19.2	1.9	4.8
Rice production	133.4	133.3	142.1	141.8	1.1	1.1
Rice consumption	134.1	135.1	138.9	140.9	0.8	0.9
Rice import	1.04	1.04	1.27	1.28	3.8	3.9
Rice export	0.77	0.79	1.45	1.54	13.8	14.5
Corn production	127.8	129.5	151.7	159.7	3.5	4.0
Corn consumption	135.5	140.6	172.3	196.9	4.7	6.1
Corn import	9.4	13.2	21.8	39.2	27	34.6
Corn export	1.2	1.2	1.0	0.9	-4.0	-4.9
Pork production	53.3	55.9	70.3	81.7	5.6	7.2
Pork consumption	53.1	55.4	70.1	80.6	5.6	7.1
Pork export	0.28	0.5	0.26	1.1	1.6	17.4
Poultry production	13.1	14.2	19.9	25.6	8.6	11.3
Poultry consumption	13.5	14.1	20.1	25.8	8.8	11.6

[a] Total grain includes only wheat, rice (milled) and coarse grains, it does not include soybeans and potato products.

7.4 Validation of Brown's Prediction

As the current CAAP-China model can only produce a simulation for the next ten years, a direct comparison to Lester Brown's prediction is not possible. However, from the simulation results, we can learn the general pattern of the long-term trends of Mainland China's grain production and consumption.

From Scenario 1, we can see that if total grain imports in Mainland China continues the projected rate of increase at 9.2 percent per annum beyond 2005, Mainland China is expected to import more than 300 million tons of grain by year 2030. However, this growth rate will not likely be maintained for the following reasons:

1) The two key factors causing the increase in grain consumption are population increase and the surging demand for meat products, which are converted by feed grain. Although the population will continue to increase in the future because of Mainland China's huge population base, it should increase at a slower rate. The pressure from the population increase will not be as heavy as in the period of 1996-2005.

2)In Scenario 1, the share of coarse grain in total grain import will increase from 24 percent in 1996 to more than 40 percent in 2005. The surging coarse grain import plays an important role in the rapid growth in grain import. Nevertheless, this increasing trend is not likely to be sustained after 2005. High coarse grain demand is the result of a rapid increase in meat demand in the rural region. When the Chinese market economy further develops, it is believed that it will not take long for meat consumption in rural region to reach the similar level as the urban residents. In the urban region, from our results presented earlier, we have already observed that the impetus for a huge increase in meat demand is not apparent, except for poultry and aquatic products. So the large increase in the import of coarse grain after 2005 is not likely. Actually, in Scenario 1, during 2004-2005, the momentum of growth rate of grain import has already been slowed down to 6 percent as compared with the average of 9.2 percent in the whole period. We believe this growth rate will further decrease in the future. If we assume an average of grain import growth rate of 3 percent from 2005 up to 2030, Mainland China's grain imports will be about 80 million tons by 2030, far less than the 305 million tons predicted by the Brown. If appropriate actions (e.g., more investment in research and education

are taken, it is quite possible that the import will not increase much after first decade of the twenty-first century, as indicated by the recent study of Huang and Rozelle (1996).

In summary, any prediction for more than 30 years into the future is very difficult, because so many uncertainties are there and so many things can happen during this long period. However, from our simulation results and analysis, we can conclude that the situation in which Mainland China will starve the world as predicted by Dr. Brown will not likely to happen in the future. However, Mainland China will certainly play a more active role in the international grain market, and is expected to import much grains, especially coarse grains during the next 10 years.

CHAPTER VIII

SUMMARY AND CONCLUSION

8.1 Summary of Major Findings

This study was divided into two parts. In the first part, the food consumption in urban area was analyzed using household survey data from 1985 to 1994. Different specifications in terms of time period and regional coverage were used to capture the differences in food consumption pattern and demand structure. Consumers were assumed to make their food consumption decision in two stages, and, thus, a two stage AIDS model was used to estimate the demand elasticities. The properties of homogeneity and symmetry condition were tested, and in most cases rejected.

The large differences in the estimated elasticities indicate different consumption behaviors among different regions and time periods. The results show that fruits and melons have the highest price elasticity, while price elasticities for other food and food groups are less than one in absolute value, and thus price inelastic. Expenditure elasticities for grain, vegetables, spirits, cigarettes, and fruits and melons are greater than one, reflecting that consumers will spend more on these food items than other food items as their income rises. Even though meat expenditure elasticities are larger when using data only from 1992 to 1994, they are still lower than expected. The unexpected low meat expenditure elasticity may reflect that Chinese urban households have different dietary habits as compared with those in other countries, and it may be unlikely that they will increase red meat consumption by much in the future. The problem may also be due to the fact that urban consumers have increased their consumption of food, particularly meats away from home. Meats consumed away from home were not included in the survey. As for grain, although the consumption of grain decreased sharply in recent years, Chinese urban consumers are still expected to allocate an important part of their increased income to grain.

Comparing the models for different regions, we observe that the expenditure elasticities for vegetable oil, spirits, cigarettes, and fruits and melons are much higher, and for grain is lower in the coastal region than the inland region, reflecting that the consumers in the coastal region will spend more on vegetable oil, spirits, cigarettes, and fruits and less on grain. Results also indicate that consumers in the coastal region are more responsive to price changes. Regional models also show substantial differences in food consumption behavior among regions.

For the meat group, results show that the demand for pork is price inelastic, while the demand for other meat products such as poultry, aquatic products, eggs, and fresh milk are price elastic, suggesting that decreases in meat prices will result in more demand for most meat products except for pork. The high price elasticities of meats implies that Chinese consumers are very sensitive to the price signal of meats. The importance of pork in the Chinese diet will continue to decrease, while poultry and aquatic products will be becoming more important as reflected by their high expenditure elasticities. In the coastal region, consumers are expected to spend more on poultry, aquatic products, and fresh milk than those in the inland area as their income rises.

For the grain group, to our surprise, all grain products are price elastic with very large price elasticities except for bread. In combination with the fact of surging grain prices after the elimination of food rationing in urban area in 1993, the recent dramatic decline in grain consumption is likely a direct consequence of the price effect. That is , recent rapid increases in grain prices, and high price elasticities have offset the expenditure effect, to cause the sharp declines of grain consumption. Furthermore, urban consumers are expected to spend more on standard flour, enriched flour, and stick rice as reflected by their higher expenditure elasticities. Consumers in the coastal region will spend more on rice, sticky rice, and standard flour, while those in inland region will spend more on sticky rice, flour, steam buns, and other fine grain.

As shown by the marginal budget shares, Chinese consumers will still spend a large part of their additional food expenditure on grain, though the quantity will decrease. Marginal expenditure shares for fruits and melons, cigarettes, and spirits will also remain relatively large. Consumers in the coastal region will spend much more of their marginal expenditure on vegetable oil, spirits, and fruits and melons. In addition, consumption of poultry will be increasing in the future. When their budget on meats increases, consumers in the coastal region will allocate more to aquatic products, and much

less to pork as compared to those in the inland region. For the grain group, consumers in the coastal region will spend most of the increase in their grain expenditure on rice, while those in the inland area will spend much more on flour, steam buns, and other fine grain.

In the part two of this study, the CPPA-China model developed by the ERS of USDA was used to simulate the agricultural production, consumption, and trade in Mainland China for 1996-2005. CPPA is a multi-commodity, and spreadsheet-based economic model for simulating a country's agricultural sector. When using CPPA-China, we develop five scenarios to analyze the future Chinese agricultural supply and demand balance based on the assumed different yield growth rates of major crops, different migration patterns between rural and urban areas, and varying income growth. Our model shows that even in the scenario with highest yield growth rate, Mainland China is still expected to import a large amount of grain, especially coarse grains in the future. By 2005, the volume of total grain imports will be more than twice as much as the highest grain import ever in history. In addition, coarse grain imports will account for more than half of grain import, and the consumption of coarse grains such as corn will make up about 40 percent of total grain consumption. The faster urbanization movement may slightly relieve the pressure on the grain market, but it may induce more demand for coarse grains. Furthermore, higher income growth will induce a higher import demand for grain. However, a situation projected by Lester Brown in which Mainland China will starve the world is not likely to happen. Nevertheless, Mainland China is expected to import more grains, especially feed grain, during the next ten years.

8.2 Implications for Agricultural Trade

Our projection results have important implications for grain exporting countries such as United States and Australia. Our projection of 38.3 million tons of import demand in China in 2005 implies that China will be a big market for grain exporters. In 1990, the total world trade of grains (wheat, rice, maize and other coarse grains) was 176.89 million tons (Rosegrant, et al., 1995). There may be questions about whether or not the grain exporters can increase their surplus to satisfy China's increasing import demand for grain. Most analysts including Alexandratos (1996) are optimistic about this. Among the reasons for this optimistic view is based on the assessment that East European Blocs, including Russia may become net grain exporters in the future. We also note that most of the projections including Rosegrant, et al. (1995) and the present study are based on the

decreasing trends of future grain prices. If the exporting countries can not meet this increasing import demand by China, then the world grain prices should increase in real terms and the higher grain prices would stimulate the supply response of grain production. Also, as noted earlier, our projections are conditional upon the specification that China will import feed grains rather than meats. This assumption is consistent with the current government policy as well as a practical consideration for the lack of adequate port and transportation facilities for meat importing. However, in the future, China may change its policy and invest in meat transportation facilities in the future. Therefore, if China imports meats in stead of feed grains to meet its increasing demand for meats, the import demand for feed grains would be smaller and the import demand for meats such as pork and poultry would be higher than those projected in the present study.

How about the implications for the grain importing countries such as Taiwan, Japan, and South Korea? Undoubtedly, they will compete with China for their imports of grains. The food security will become a more important issue in these grain importing countries in the future. They will become even more reluctant to give up their production capacity of staple food. On the other hand, the increasing demand for grain will put much pressure on the Chinese government from central to local levels to increase its grain production. This can only be accomplished by asking farmers not to divert too much of their land from producing grains. As a result, farmers will be discouraged to grow more profitable cash crops or rice for export. Under this situation, China may not be able to continue its recent trends of exporting such products as fresh vegetables, rice, soybeans, and peanuts. Perhaps, Taiwan and japan need not have to be concerned about the possible dumping effects on their domestic agricultural sector, as so perceived by agricultural policy makers in these Asian net agricultural importing countries.

According to our projection, Mainland China will export high quality rice but import lower quality rice in the future. Specifically, under Scenario 1, Mainland China will export 1.45 million tons and import 1.27 million tons of rice in 2005, with a net export of 0.18 million tons. This quantity of rice export is relatively small in comparison to its total production. However, this amount of rice export would be sizable relative to the domestic production of rice in Taiwan. In 1996, Taiwan produced only 1.57 million tons of rice (in semi-milled basis). One may perceive that if Mainland China attempt to export all this projected amount of rice to Taiwan, it may severely impact the rice

sector in Taiwan. However, we can examine the recent trend of Mainland China's rice trade. Mainland China has been exporting high quality rice from the northeast region and importing lower quality rice in the south. Due to its vicinity to China's northeast region and its strong demand for high quality rice, Japan has been the major market for China's rice exports. For example, in 1994, Japan imported 640 million kg of husked rice from Mainland China, representing 98.7% of China's total export of husked rice. In the same year, almost half of Mainland China's exported fine rice (422 million kg) went to Japan. Therefore, if Mainland China continues to export rice in the future, it should target Japan as its major market. Our view is that Taiwan's rice sector will be more likely affected by the world market situation than by the export from Mainland China.

8.3 Future Research

On the demand side, as mentioned in the study, the year 1992 and part of 1993 were still under food rationing. The inclusion of the rationing impact into the model would provide a more precise presentation of food consumption behavior in urban Mainland China. In addition, macroeconomic phenomena such as the high inflation rate in 1994, as well as surging prices of agricultural products, especially grain may result in some distortion of food consumption behavior. Urban consumers may still be in the stage of recovering from the shock of losing subsidies from food rationing. From the latest information, the inflation rates in 1995, and in 1996 were much lower, and the availability of more data after 1993 will further enhance our understanding of the consumption behavior of urban residents.

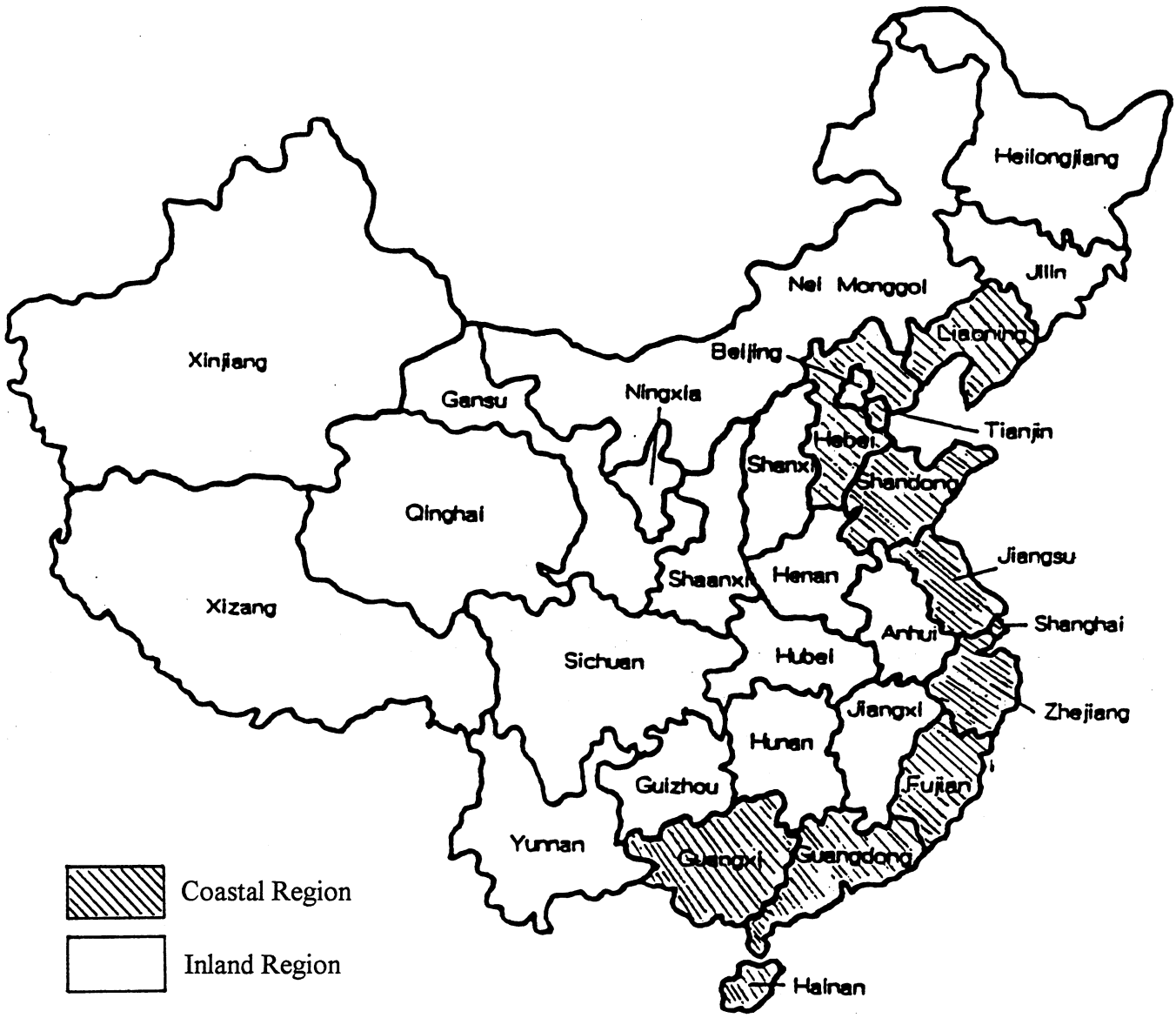
Furthermore, the rapid increases in personal income, the elimination of intervention in consumption choice, and other macroeconomic situations may also lead to transition in people's consumption behavior. The inclusion of dynamic feature into the model may give us more insights into these issues.

For several meat products such as beef, mutton, and milk, production location may place restrictions on their consumption. Zuo (1995) extended the single demand equation to incorporate the restricted supply in the analysis of fresh milk consumption in Mainland China, and their results showed that supply availability had a strong impact on fresh milk consumption. Further adjustment

of the model to account for supply constraints may also give us clearer picture of consumption behavior of these products.

In the simulation model of CPPA-China, more work needs to be done in the future. Certainly, more reliable data are needed. The price determination process should be further analyzed to see how the domestic prices of agricultural products are affected by the international prices, domestic supply, and demand. Demand elasticities, especially those for the rural region, need to be carefully studied and updated. Finally, further understanding is also necessary about agricultural trade in Mainland China. Will agricultural trade still be used as a tool to balance the domestic market in the future? Or will it be the result of market mechanism and endogenously determined as a response to changes in external market? These questions will have large impacts on any prediction of Chinese agricultural trade in the future.

APPENDIX A
MAP OF MAINLAND CHINA



APPENDIX B
PARAMETER ESTIMATES FOR SELECTED MODEL SPECIFICATIONS

(with homogeneity and symmetry imposed)

Table B.1

Parameter Estimates for the Whole Country (First Stage), 1985-1994[a]

Commodity	γ_1	γ_2	γ_3	γ_4	γ_5	γ_6	γ_7	β_j
Grain	0.074503	0.00286205	-0.00897716	-0.045950	-0.00455709	0.010840	-0.031732	0.030868
	(13.75)	(1.05)	(-1.12)	(-12.66)	(-4.83)	(4.37)	(-9.28)	(2.36)
Veg. Oil		0.029821	-0.023175	0.00273057	-0.00057115	0.00433584	0.00010827	-0.00522321
		(8.59)	(-5.83)	(0.98)	(-0.52)	(3.02)	(0.05)	(-1.11)
Meats			-0.032288	0.048141	-0.00064009	-0.00335604	-0.00194976	-0.300477
			(-1.72)	(7.00)	(-0.42)	(-0.69)	(-0.29)	(-11.48)
Vegetables				-0.00814045	0.00041856	-0.012969	0.010132	0.064567
				(-1.48)	(0.38)	(-5.48)	(2.95)	(6.83)
Sugar					0.00451043	0.00131200	-0.00301116	-0.00300466
					(4.17)	(2.24)	(-4.04)	(-1.64)
Spirit & beer						0.00468495	-0.00142546	0.047139
						(1.99)	(-0.66)	(6.38)
Cigarettes							0.040808	0.089321
							(10.16)	(8.34)

[a]Figures in the parentheses are estimated T-ratios.

Table B.2

Parameter Estimates for the Whole Country (First Stage), 1992-1994[a]

Commodity	γ_1	γ_2	γ_3	γ_4	γ_5	γ_6	γ_7	β_j
Grain	0.080736	0.019087	-0.077806	-0.036372	0.00142354	0.029476	-0.027197	0.014236
	(5.37)	(2.59)	(-3.49)	(-3.92)	(1.15)	(5.50)	(-2.92)	(0.60)
Veg. Oil		0.030919	-0.042106	0.012915	-0.00264921	0.00628077	-0.00892339	-0.00522
		(3.51)	(-3.80)	(1.87)	(-1.88)	(2.44)	(-1.67)	(-1.04)
Meats			0.106878	0.036073	0.00034251	-0.043937	0.00487060	-0.198393
			(2.15)	(2.09)	(0.19)	(-4.33)	(0.27)	(-4.17)
Vegetables				0.00458051	-0.00231830	-0.00260004	-0.016358	0.039822
				(0.35)	(-1.77)	(-0.61)	(-1.91)	(2.33)
Sugar					-0.00093009	-0.00007273	0.00317218	-0.00141189
					(-1.15)	(-0.17)	(3.37)	(-0.94)
Spirit & beer						0.00497382	0.00979889	0.021602
						(1.29)	(2.24)	(1.59)
Cigarettes							0.053163	0.080217
							(5.14)	(4.27)

[a]Figures in parentheses are estimated T-ratios.

Table B.3

Parameter Estimates in the Coastal Region (First Stage), 1985-1994[a]

Commodity	γ_1	γ_2	γ_3	γ_4	γ_5	γ_6	γ_7	β_j
Grain	0.078575	-0.00267045	-0.044924	-0.037769	-0.00356756	0.011549	-0.013784	-0.026505
	(8.86)	(-0.75)	(-3.55)	(-5.19)	(-2.41)	(2.46)	(-3.48)	(-1.46)
Veg. Oil		0.046173	-0.027668	-0.00343578	-0.00446322	0.00068936	-0.00168629	0.015938
		(9.40)	(-4.08)	(-0.69)	(-2.72)	(0.26)	(-0.73)	(2.95)
Meats			0.026151	0.034755	-0.012245	-0.00545187	0.019813	-0.281188
			(0.84)	(2.17)	(-3.71)	(-0.49)	(2.29)	(-9.42)
Vegetables				-0.018079	0.00893430	0.016844	0.00616963	0.047131
				(-1.25)	(3.53)	(2.70)	(1.12)	(3.14)
Sugar					0.013311	-0.00418490	-0.00229732	-0.020113
					(7.97)	(-3.10)	(-2.18)	(-6.25)
Spirit & beer						0.00330847	-0.00796750	0.086753
						(0.70)	(-2.50)	(7.74)
Cigarettes							0.017874	0.080565
							(4.36)	(9.40)

[a]Figures in parentheses are estimated T-ratios.

Table B.4

Parameter Estimates In the Coastal Region (First Stage), 1992-1994[a]

Commodity	γ_1	γ_2	γ_3	γ_4	γ_5	γ_6	γ_7	β_j
Grain	0.035552	0.036540	-0.034322	-0.050693	0.00105610	0.00382551	-0.018105	-0.00112224
	(2.36)	(3.87)	(-1.48)	(-2.83)	(0.54)	(0.47)	(-2.11)	(-0.05)
Veg. Oil		0.00677993	-0.046419	-0.016340	0.00156370	0.012428	-0.00133281	0.00009725
		(0.42)	(-2.83)	(-1.14)	(0.65)	(2.14)	(-0.19)	(0.01)
Meats			0.019687	0.108869	-0.013567	-0.028751	0.017607	-0.260974
			(0.31)	(2.98)	(-3.94)	(-1.32)	(0.89)	(-5.72)
Vegetables				-0.00570530	0.00132092	0.016934	-0.030683	0.082545
				(-0.14)	(0.40)	(1.29)	(-1.84)	(2.52)
Sugar					0.00523135	-0.00335036	0.00583839	-0.013039
					(4.18)	(-2.72)	(4.11)	(-5.02)
Spirit & beer						0.018549	-0.00751769	0.071549
						(2.14)	(-1.05)	(4.30)
Cigarettes							0.038244	0.062327
							(3.60)	(4.09)

[a]Figures in Parentheses are estimated T-ratios.

Table B.5
Parameter Estimates In the Inland Region (First Stage), 1985-1994[a]

Commodity	γ_1	γ_2	γ_3	γ_4	γ_5	γ_6	γ_7	β_j
Grain	0.085831	0.011643	-0.015379	-0.046206	-0.00530755	0.00815693	-0.036627	0.070346
	(16.59)	(3.59)	(-1.95)	(-13.53)	(-4.92)	(2.97)	(-8.95)	(4.83)
Veg. Oil		0.018233	-0.029322	0.00393996	0.00294157	0.00437200	0.00130983	-0.027361
		(4.49)	(-6.30)	(2.19)	(2.32)	(2.17)	(0.43)	(-3.76)
Meats			0.00955604	0.034988	0.00192016	-0.00344285	-0.016949	-0.214175
			(0.51)	(5.72)	(1.23)	(-0.64)	(-2.11)	(-6.93)
Vegetables				0.014776	-0.00405392	-0.020792	0.00636094	0.060061
				(2.83)	(-3.40)	(-8.16)	(1.63)	(6.05)
Sugar					0.00150716	0.00330811	-0.00533363	0.00127844
					(1.16)	(4.54)	(-5.64)	(-0.59)
Spirit & beer						0.00981616	-0.00120470	0.00378174
						(3.19)	(-0.39)	(0.37)
Cigarettes							0.058429	0.070300
							(9.45)	(4.52)

[a]Figures in Parentheses are estimated T-ratios.

Table B.6
Parameter Estimates In the Inland Region (First Stage), 1992-1994[a]

Commodity	γ_1	γ_2	γ_3	γ_4	γ_5	γ_6	γ_7	β_j
Grain	0.107210 (7.66)	0.032732 (4.01)	-0.087162 (-3.95)	-0.033502 (-4.10)	-0.00015109 (-0.10)	0.015094 (2.39)	-0.025633 (-2.15)	0.041847 (1.56)
Veg. Oil		0.010709 (1.20)	-0.039753 (-3.22)	0.016597 (2.47)	-0.00127166 (-0.77)	0.00057707 (0.14)	-0.00391670 (-0.48)	-0.031646 (-2.07)
Meats			0.116134 (2.29)	0.011324 (0.76)	0.00067008 (0.35)	-0.019060 (-1.55)	-0.014911 (-0.62)	--0.131064 (-2.28)
Vegetables				0.025977 (2.55)	-0.00299980 (-2.09)	-0.015680 (-2.26)	0.00370322 (0.38)	0.017398 (0.96)
Sugar					-0.00187773 (-1.88)	0.00049667 (0.78)	0.00113602 (0.83)	-0.00048884 (-0.24)
Spirit & beer						-0.00523455 (-0.66)	0.089020 (4.69)	0.00402492 (0.21)
Cigarettes							0.058429 (9.45)	0.073018 (2.37)

[a]Figures in Parentheses are estimated T-ratios.

Table B.7

Parameter Estimates of Meat Subgroup for the Whole Country (Second Stage), 1992-1994[a]

Commodity	γ_1	γ_2	γ_3	γ_4	γ_5	γ_6	γ_7	β_i
Pork	0.100190 (1.31)	-0.026607 (-0.88)	-0.00106488 (-0.02)	-0.091424 (-2.72)	0.140759 (-3.74)	-0.081920 (-2.20)	0.010246 (0.82)	0.017268 (0.40)
Beef		0.049009 (2.00)	-0.041742 (-2.18)	0.00217357 (0.11)	0.068178 (3.62)	-0.017970 (-1.03)	-0.013881 (-1.80)	-0.00881102 (-0.48)
Mutton			-0.046862 (-1.07)	0.029062 (1.36)	0.016205 (0.59)	0.080458 (2.85)	-0.015410 (-1.77)	-0.135207 (-3.70)
Poultry				-0.091119 (-3.16)	028803 (1.32)	-0.047093 (-2.45)	0.033086 (3.72)	0.114735 (5.97)
Eggs					-0.078358 (-2.37)	-0.026443 (-1.09)	-0.045906 (-5.43)	-0.105203 (3.63)
Aquatic Products						0.020703 (0.59)	0.039836 (5.30)	0.195625 (5.86)
Fresh Milk							-0.018571 (-3.68)	-0.00947032 (-1.16)

[a]Figures in Parentheses are estimated T-ratios.

Table B.8

Parameter Estimates of Meat Subgroup In the Coastal Region (Second Stage), 1992-1994[a]

Commodity	γ_1	γ_2	γ_3	γ_4	γ_5	γ_6	γ_7	β_j
Pork	0.055799	0.080908	0.022970	-0.124722	0.109263	-0.137259	0.017154	-0.00667343
	(1.35)	(4.09)	(1.87)	(-3.96)	(3.21)	(-5.25)	(1.44)	(-0.22)
Beef		-0.050511	0.00178849	-0.036869	0.020401	-0.010919	-0.024519	-0.059415
		(-2.89)	(0.22)	(-1.99)	(1.08)	(-0.69)	(-3.58)	(-3.13)
Mutton			-0.030524	0.090228	-0.060616	0.011664	0.00040671	-0.020295
			(-3.93)	(6.74)	(-5.18)	(1.14)	(0.09)	(-1.50)
Poultry				0.016847	0.092951	-0.186265	-0.00083825	0.128661
				(0.37)	(2.53)	(-5.66)	(-0.06)	(2.83)
Eggs					-0.00411197	0.057877	-0.059665	-0.190399
					(-0.09)	(-1.84)	(-4.74)	(-4.38)
Aquatic Products						0.176757	0.046248	0.202326
						(3.70)	(4.21)	(3.42)
Fresh Milk							-0.013696	0.00602934
							(-2.39)	(0.39)

[a]Figures in Parentheses are estimated T-ratios.

Table B.9

Parameter Estimates of Meat Subgroup In the Inland Region (Second Stage), 1992-1994[a]

Commodity	γ_1	γ_2	γ_3	γ_4	γ_5	γ_6	γ_7	β_j
Pork	0.015822	-0.069242	0.083131	-0.042472	0.064815	0.032217	0.014829	-0.220521
	(0.17)	(-1.54)	(1.26)	(-1.23)	(1.30)	(0.90)	(0.98)	(2.94)
Beef		0.073007	-0.062046	0.036985	0.059779	-0.034419	0.00453148	-0.043352
		(1.70)	(-2.07)	(1.49)	(1.80)	(-1.41)	(0.40)	(-1.20)
Mutton			-0.053658	-0.00205807	0.033718	0.038530	-0.018975	-0.180977
			(-0.80)	(-0.09)	(0.93)	(1.41)	(-1.77)	(-2.48)
Poultry				-0.105013	-0.00573155	-0.00739654	0.028443	0.102348
				(-3.65)	(-0.21)	(-0.40)	(2.73)	(4.06)
Eggs					-0.086389	-0.00173255	-0.031588	-0.058542
					(-1.76)	(-0.06)	(-2.55)	(-1.32)
Aquatic Products						-0.104186	0.044551	0.018097
						(-3.70)	(5.27)	(0.55)
Fresh Milk							-0.026149	-0.00094592
							(-4.12)	(-0.08)

[a]Figures in Parentheses are estimated T-ratios.

Table B.10

Parameter Estimates of Grain Subgroup For the Whole Country (Second Stage), 1992-1994[a]

Commodity	γ_1	γ_2	γ_3	γ_4	γ_5	γ_6	γ_7	β_j
Rice	-0. 763532	-0.00818617	0.359704	0.292193	-0.00660917	0.202253	-0.099350	-0.085121
	(-10.27)	(-4.55)	(6.76)	(5.88)	(-0.76)	(7.50)	(-4.49)	(-1.06)
Sticky Rice		-0.00215173	-0.00616255	0.00725640	0.00309344	0.00104330	-0.00076759	0.00422460
		(-1.35)	(-2.06)	(2.14)	(2.32)	(0.84)	(-0.51)	(2.54)
Standard Flour			-0.231674	-0.013255	0.00983750	-0.058538	-0.031833	0.156974
			(-2.75)	(-0.16)	(0.67)	(-2.22)	(-1.11)	(2.72)
Enriched Flour				-0.351582	-0.054296	-0.040337	0.166512	0.096806
				(-3.48)	(-3.35)	(-1.49)	(5.12)	(1.97)
Bread					0.020220	-0.010756	0.025164	-0.062784
					(2.93)	(-1.72)	(3.81)	(-7.44)
Steam Buns						-0.051746	-0.028981	-0.034229
						(-3.14)	(-2.41)	(-1.05)
Other Fine Grains							-0.048749	-0.058981
							(-2.54)	(-2.65)

[a]Figures in Parentheses are estimated T-ratios.

Table B.11

Parameter Estimates of Grain Subgroup In the Coastal Region (Second Stage), 1992-1994[a]

Commodity	γ_1	γ_2	γ_3	γ_4	γ_5	γ_6	γ_7	β_j
Rice	-0.832522	-0.00475098	0.314896	0.298901	-0.016476	0.227257	-0.021803	0.259994
	(-7.28)	(-1.77)	(5.00)	(6.33)	(-0.75)	(7.50)	(-0.78)	(1.96)
Sticky Rice		-0.00168902	-0.00306697	-0.00876022	0.00553215	0.00182657	0.00573179	0.011456
		(-0.97)	(-0.87)	(-1.93)	(2.83)	(1.17)	(2.11)	(4.15)
Standard Flour			-0.042172	-0.147119	0.00884756	-0.072451	-0.060745	0.029780
			(-0.69)	(-3.23)	(0.42)	(-3.36)	(-2.21)	(0.39)
Enriched Flour				0.00180691	-0.026839	-0.054190	-0.034847	-0.044084
				(0.03)	(-1.28)	(-2.86)	(-1.20)	(-0.84)
Bread					0.028984	-0.018640	0.016152	-0.078452
					(1.84)	(-1.54)	(1.10)	(-3.18)
Steam Buns						-0.057657	-0.014084	-0.097916
						(-3.89)	(-1.06)	(-2.56)
Other Fine Grains							0.100884	-0.078399
							(3.99)	(-2.41)

[a]Figures in Parentheses are estimated T-ratios.

Table B.12

Parameter Estimates of Grain Subgroup In the Inland Region (Second Stage), 1992-1994[a]

Commodity	γ_1	γ_2	γ_3	γ_4	γ_5	γ_6	γ_7	β_j
Rice	-0.619449	-0.012141	0.298280	0.304383	-0.00281363	0.166403	-0.146110	-0.234996
	(-6.49)	(-5.04)	(3.84)	(4.01)	(-0.60)	(3.78)	(-5.93)	(-2.01)
Sticky Rice		-0.00041515	0.00079584	0.00906225	0.00213698	-0.00481928	0.00033159	0.00079069
		(-0.21)	(0.22)	(2.20)	(1.45)	(-2.26)	(0.20)	(0.33)
Standard Flour			-0.329833	0.139421	-0.00684880	-0.83834	0.043324	0.138020
			(-2.52)	(1.10)	(-0.88)	(-1.18)	(1.18)	(1.43)
Enriched Flour				-0.572500	-0.023315	-0.046325	0.156587	0.139147
				(-3.49)	(-2.68)	(-0.82)	(3.78)	(1.50)
Bread					0.016596	0.00748996	0.00748996	-0.023597
					(5.11)	(1.75)	(1.75)	(-4.78)
Steam Buns						-0.037673	-0.00347461	0.00802143
						(-1.00)	(-0.17)	(0.14)
Other Fine Grains							-0.087501	0.00837475
							(-4.45)	(0.30)

[a]Figures in Parentheses are estimated T-ratios.

APPENDIX C
ELASTICITY MATRIXES USED IN CPPA

Table C.1

Food Demand Elasticity Matrices Used in CPPA

Product	Base Year Share	Price Elasticity of Meat	Grain	Edible Oil	Oil Seed	Sugar	Income Elasticity
			Urban Households				
Meat	0.591	-0.54	0.01	0.02	0.02	0.01	0.47
Grain	0.339	-0.46	-0.57	0	0	0	0.40
Edible Oil	0.025	-0.21	-0.12	-0.40	-0.01	0	0.74
Oil Seed	0.032	0	0	0	-0.05	0	0.05
Sugar	0.013	-0.43	-0.25	-0.02	-0.02	-0.02	0.73
			Rural Households				
Meat	0.591	-0.38	-0.04	-0.31	-0.39	-0.16	1.27
Grain	0.339	-0.46	-1.00	0.32	0.04	0.16	0.40
Edible Oil	0.025	-0.21	-0.12	-0.40	-0.01	0	0.74
Oil Seed	0.032	0	0	0	-0.05	0	0.05
Sugar	0.013	-0.43	-0.25	-0.02	-0.02	-0.02	0.73

Table C.2

Elasticity Matrices of Meat Demand Used in CPPA

Product	Base Year Share	Price Elasticity of Beef	Milk	Pork	Mutton	Fish	Poultry	Eggs	Income Elasticity
				Urban Households					
Beef	0.070	-0.04	-0.05	-0.19	-0.01	-0.04	-0.03	-0.04	0.40
Milk	0.124	0.12	-1.75	0.88	0.06	0.17	0.15	0.17	0.20
Pork	0.501	0.04	0.07	-0.74	0.02	0.05	0.05	0.05	0.45
Mutton	0.033	0.18	0.31	1.26	-1.93	0.24	0.21	0.24	-0.50
Fish	0.094	0	0	-0.01	0	-1.08	0	0	1.10
Poultry	0.086	0.06	0.10	0.40	0.03	0.08	-1.84	0.08	1.10
Eggs	0.094	0.10	0.17	0.69	0.04	0.13	0.12	-1.45	0.20
				Rural Households					
Beef	0.070	-0.04	-0.05	-0.19	-0.01	-0.04	-0.03	-0.04	0.40
Milk	0.124	0.12	-1.75	0.88	0.06	0.17	0.15	0.17	0.20
Pork	0.501	0.04	0.07	-0.74	0.02	0.05	0.05	0.05	0.45
Mutton	0.033	0.10	0.18	0.74	-1.93	0.14	0.13	0.14	0.50
Fish	0.094	0	0	-0.01	0	-1.08	0	0	1.10
Poultry	0.086	0.06	0.10	0.40	0.03	0.08	-1.84	0.08	1.10
Eggs	0.094	0.10	0.17	0.69	0.04	0.13	0.12	-1.45	0.20

Table C.3

Elasticity Matrices of Grain Demand Used in CPPA

Product	Base Year Share	Price Elasticity of				Income Elasticity
		Wheat	Rice	Coarse Grains Except Barley	Barley	
			Urban Households			
Wheat	0.389	-2.00	1.35	0.55	0.07	0.80
Rice	0.495	0.30	-1.00	0.15	0.04	0.40
Coarse Grains Except Barley	0.100	0.22	0.28	-0.50	0.01	-0.10
Barley	0.013	0.08	0.10	0.02	-0.20	0.70
			Rural Households			
Wheat	0.389	-0.46	0.14	0.28	0.04	0.39
Rice	0.495	0.14	-0.55	0.05	0.05	0.31
Coarse Grains Except Barley	0.100	0.10	0.13	-0.24	0	0.03
Barley	0.013	0.08	0.10	0.02	-0.20	0.70

APPENDIX D
PROJECTIONS OF THE SELECTED AGRICULTURAL PRODUCTS
(Computer Outputs)

Projections of Selected Agricultural Products in Scenario 1

COUNTRY: China FILE: c96fchn1.CAL DATE: 6/6/1996

WHEAT	BASE	MY1997	MY1998	MY1999	MY2000	MY2001	MY2002	MY2003	MY2004	MY2005	Ann Chg
TOTAL GRAIN PRODUCTION	347925	356418	361227	370381	379150	388407	397016	406121	415445	424735	2.0%
TOTAL GRAIN CONSUMPTION	359197	375854	383498	393392	401574	414236	426280	437459	448834	460329	2.5%
TOTAL GRAIN IMPORTS	16978	17345	20492	22772	23701	27729	31763	35232	38274	40796	9.2%
Area Harvested	29000	27069	28064	27874	28045	28264	28224	28292	28291	28324	-.2%
Area Harvested Northeast	1425	1321	1372	1353	1361	1370	1365	1367	1366	1364	-.4%
Area Harvested North	12663	11747	12164	12073	12158	12256	12249	12285	12291	12310	-.3%
Area Harvested Northwest	5393	5204	5346	5352	5398	5452	5473	5506	5532	5562	.3%
Area Harvested East	4465	4053	4220	4155	4144	4148	4098	4070	4029	3996	-1.1%
Area Harvested Central	3760	3536	3680	3657	3673	3699	3688	3693	3687	3688	-.2%
Area Harvested South	1294	1208	1282	1285	1311	1340	1352	1371	1386	1404	.8%
Yield	3.42	3.43	3.52	3.60	3.69	3.77	3.85	3.93	4.01	4.09	1.8%
Yield Northeast	2.45	2.46	2.53	2.58	2.65	2.71	2.76	2.82	2.88	2.94	1.8%
Yield North	4.02	4.04	4.16	4.25	4.35	4.45	4.55	4.64	4.74	4.84	1.9%
Yield Northwest	2.67	2.69	2.76	2.82	2.89	2.96	3.02	3.08	3.15	3.21	1.9%
Yield East	3.72	3.74	3.84	3.93	4.03	4.12	4.20	4.29	4.38	4.47	1.9%
Yield Central	2.99	3.00	3.09	3.16	3.24	3.31	3.38	3.45	3.52	3.59	1.9%
Yield South	1.92	1.93	1.99	2.03	2.08	2.13	2.17	2.22	2.27	2.31	1.9%
Production	99180	92842	98906	100318	103445	106578	108587	111096	113339	115770	1.6%
Production Northeast	3495	3257	3476	3492	3602	3710	3771	3858	3934	4012	1.4%
Production North	50937	47495	50546	51267	52934	54571	55673	57017	58228	59526	1.6%
Production Northwest	14408	13975	14756	15093	15610	16124	16521	16974	17407	17863	2.2%
Production East	16612	15156	16216	16317	16684	17081	17225	17470	17649	17868	.7%
Production Central	11240	10625	11363	11539	11885	12238	12458	12735	12980	13253	1.7%
Production South	2489	2336	2549	2609	2730	2854	2938	3043	3140	3247	2.7%
		13777	14440	14800	15100	15400	15818	16624	17212	17854	
Beginning Stocks	14157	19250	19192	19697	19783	19800	20231	20500	20796	21028	4.0%
Imports*	12000	14105	12711	12670	10901	12038	12843	13550	14102	14443	1.9%
Exports	0	0	0	0	0	0	0	0	0	0	
Consumption Demand	106087	107005	111111	112902	114328	118186	121161	124350	127209	130000	2.1%
Food Demand	102787	103561	107521	109154	110433	114131	116950	119984	122692	125341	2.0%
Food Demand Urban	15952	15533	17206	17794	18260	19575	20497	21647	22607	23524	4.0%
Food Demand Rural	86835	88028	90316	91360	92174	94556	96453	98337	100085	101817	1.6%
Feed Demand	3300	3444	3590	3748	3894	4054	4211	4366	4517	4659	3.5%
Other Demand	0	0	0	0	0	0	0	0	0	0	
Ending Stocks	19250	19192	19697	19783	19800	20231	20500	20796	21028	21240	1.0%
WB Import Number	12000	13777	14440	14800	15100	15400	15818	16624	17212	18154	4.2%
Baseline-WB Difference	0	328	-1729	-2130	-4199	-3362	-2975	-3074	-3110	-3711	
Consistency Checks:											
End Stks/Consumption	18.1	17.9	17.7	17.5	17.3	17.1	16.9	16.7	16.5	16.3	-1.0%
Imps/Consumption Dmd	11.3	13.2	11.4	11.2	9.5	10.2	10.6	10.9	11.1	11.1	-.2%
Per Cap Production	80.8	74.6	78.4	78.4	79.7	81.0	81.4	82.1	82.6	83.2	.3%
Per Cap Total Cons	86.4	86.0	88.0	88.2	88.1	89.8	90.8	91.9	92.7	93.5	.8%
Per Cap Food	83.7	83.2	85.2	85.3	85.1	86.7	87.7	88.7	89.4	90.1	.7%
Per Cap Food Urban	45.1	43.0	46.6	47.1	47.3	49.6	50.8	52.5	53.7	54.6	1.9%
prcpwh		-5.3	.2	-1.8	-2.1	-.3	-1.0	-.7	-1.0	-.8	
prcpri		1.8	1.0	.5	.6	.9	.7	.9	.6	.6	
prcpcg		-.8	1.1	.4	.6	.4	.5	.6	.6	.4	
prcpba		.5	.0	.0	.0	.0	.0	.0	.0	.0	
pcdgdpur		2.0	1.7	1.7	1.5	1.4	1.3	1.2	1.1	1.0	
crpcfgtour		-.4	-.4	-.2	-.4	-.1	-.2	-.3	-.2	-.2	
Total change		-2.1	3.6	.5	.2	2.3	1.2	1.7	1.1	1.0	
Per Cap Food Rural	102.0	99.7	101.2	101.3	101.1	102.6	103.6	104.5	105.3	106.0	.4%
prcpwh		-2.7	.1	-.9	-1.0	-.1	-.5	-.3	-.4	-.4	
prcpri		.4	.2	.1	.1	.2	.1	.2	.1	.1	
prcpcg		-.9	1.3	.4	.7	.5	.5	.6	.6	.4	
prcpba		.6	.0	.0	.0	.0	.0	.0	.0	.0	
pcdgdpru		2.2	1.9	1.8	1.6	1.4	1.3	1.2	1.0	.9	
crpcfgtoru		-1.9	-2.0	-1.3	-1.5	-.4	-.5	-.7	-.6	-.4	
Total change		-2.3	1.5	.1	-.2	1.5	1.0	.9	.8	.7	
Per Cap Feed	2.7	2.8	2.8	2.9	3.0	3.1	3.2	3.2	3.3	3.3	2.2%

COUNTRY: China FILE: c96fchn1.CAL DATE: 6/ 6/1996

RICE	BASE	MY1997	MY1998	MY1999	MY2000	MY2001	MY2002	MY2003	MY2004	MY2005	Ann Chg
Area Harvested	30544	30735	29825	29804	29633	29481	29463	29370	29320	29208	-.4%
Area Harvested Northeast	1876	1870	1875	1840	1823	1802	1783	1766	1749	1729	-.8%
Area Harvested North	766	773	769	759	751	742	736	729	722	715	-.7%
Area Harvested Northwest	370	375	375	374	373	372	372	371	371	370	.0%
Area Harvested East	6606	6643	6400	6312	6177	6051	5957	5850	5751	5644	-1.6%
Area Harvested Central	12451	12489	12079	12090	12023	11967	11963	11926	11906	11859	-.5%
Area Harvested South	8475	8585	8326	8430	8487	8548	8651	8728	8822	8891	.5%
Yield	4.16	4.28	4.35	4.43	4.50	4.57	4.64	4.72	4.79	4.87	1.6%
Yield Northeast	3.92	4.04	4.08	4.14	4.20	4.26	4.32	4.38	4.43	4.49	1.4%
Yield North	4.64	4.78	4.83	4.90	4.97	5.04	5.11	5.18	5.25	5.32	1.4%
Yield Northwest	3.76	3.87	3.92	3.97	4.03	4.08	4.14	4.19	4.25	4.31	1.4%
Yield East	4.55	4.68	4.76	4.85	4.94	5.02	5.11	5.19	5.28	5.37	1.7%
Yield Central	4.37	4.50	4.57	4.66	4.74	4.82	4.90	4.99	5.07	5.15	1.7%
Yield South	3.58	3.68	3.74	3.82	3.88	3.95	4.02	4.09	4.15	4.22	1.7%
Production	127062	131614	129703	131979	133356	134769	136832	138611	140522	142124	1.1%
Production Northeast	7361	7549	7658	7621	7655	7672	7697	7728	7754	7769	.5%
Production North	3557	3691	3715	3716	3731	3736	3757	3772	3788	3801	.7%
Production Northwest	1391	1451	1468	1485	1502	1519	1539	1558	1576	1595	1.4%
Production East	30040	31109	30462	30627	30491	30374	30413	30386	30366	30287	.1%
Production Central	54388	56180	55221	56347	57012	57705	58671	59499	60386	61132	1.2%
Production South	30324	31634	31180	32183	32965	33764	34755	35668	36652	37541	2.2%
Beginning Stocks	18724	17829	13785	9934	7738	7249	6932	7346	9142	11935	-4.4%
Imports	878	926	963	1002	1039	1084	1130	1167	1215	1274	3.8%
prcpri		25	17	7	9	15	11	15	10	10	
prmpri		7	5	15	11	12	18	3	19	29	
trend		15	16	17	17	17	18	19	19	20	
Total change		48	37	39	37	44	47	36	48	58	
Exports	398	573	604	691	774	868	996	1123	1277	1448	13.8%
prexri		15	14	15	15	21	25	17	30	43	
crprrito		74	-43	55	37	42	69	67	80	75	
pcdgdp		7	10	10	11	12	13	15	16	17	
crexrito(-1)		79	50	7	20	19	21	29	29	35	
Total change		175	32	87	83	94	128	127	154	170	
Consumption Demand	128437	136011	133913	134486	134111	135301	136554	136859	137667	138853	.8%
Food Demand	128437	136011	133913	134486	134111	135301	136554	136859	137667	138853	.8%
Feed Demand	0	0	0	0	0	0	0	0	0	0	
Other Demand	0	0	0	0	0	0	0	0	0	0	
Ending Stocks*	17829	13785	9934	7738	7249	6932	7346	9142	11935	15032	-1.7%
WB Import Number	400	400	500	500	600	600	600	700	700	800	7.2%
WB Export Number	800	1000	800	800	1100	1300	1400	1400	1600	1700	7.8%
Consistency Checks:											
End Stks/Consumption	13.9	10.1	7.4	5.8	5.4	5.1	5.4	6.7	8.7	10.8	-2.5%
Food/Consumption Dmd	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	.0%
Imps/Consumption Dmd	.7	.7	.7	.7	.8	.8	.8	.9	.9	.9	3.0%
Exps/Production	.3	.4	.5	.5	.6	.6	.7	.8	.9	1.0	12.5%
Per Cap Production	103.5	105.7	102.8	103.1	102.8	102.4	102.6	102.5	102.4	102.2	-.1%
Pct Change in Prodn	1.4	3.6	-1.5	1.8	1.0	1.1	1.5	1.3	1.4	1.1	
Per Cap Total Cons	104.6	109.3	106.1	105.1	103.4	102.8	102.3	101.2	100.4	99.8	-.5%
Per Cap Food	104.6	109.3	106.1	105.1	103.4	102.8	102.3	101.2	100.4	99.8	-.5%
Per Cap Food Urban	55.0	55.1	54.8	55.7	56.0	56.1	56.3	56.1	56.2	56.3	.2%
prcpwh		1.0	.0	.3	.4	.1	.2	.1	.2	.1	
prcpri		-1.6	-1.0	-.4	-.5	-.8	-.6	-.7	-.5	-.5	
prcpcg		-.3	.4	.1	.2	.1	.2	.2	.2	.1	
prcpba		.4	.0	.0	.0	.0	.0	.0	.0	.0	
pcdgdpur		1.5	1.4	1.2	1.1	1.0	.9	.8	.7	.6	
crpcfgtour		-.9	-1.0	-.4	-.9	-.2	-.4	-.6	-.5	-.4	
Total change		.1	-.3	.8	.3	.2	.2	-.2	.1	.1	

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RICE	BASE	MY1997	MY1998	MY1999	MY2000	MY2001	MY2002	MY2003	MY2004	MY2005	Ann Chg
Per Cap Food Rural	134.0	131.5	127.3	125.8	123.4	122.8	122.3	120.9	119.9	119.3	-1.2%
prcpwh		1.1	.0	.3	.4	.1	.2	.1	.2	.1	
prcpri		-2.1	-1.3	-.5	-.6	-1.0	-.7	-.9	-.6	-.5	
prcpcg		-.2	.3	.1	.2	.1	.1	.1	.1	.1	
prcpba		1.0	.0	.0	.0	.0	.0	.0	.0	.0	
pcdgdpru		2.7	2.2	1.8	1.5	1.2	1.0	.8	.7	.6	
crpcfgtoru		-5.0	-5.4	-3.3	-3.8	-1.0	-1.2	-1.6	-1.4	-.8	
Total change		-2.5	-4.1	-1.6	-2.4	-.6	-.6	-1.4	-1.0	-.6	
Per Cap Feed	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
Per Cap Other	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
Pct Change in Cons	.3	5.9	-1.5	.4	-.3	.9	.9	.2	.6	.9	

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CORN	BASE	MY1997	MY1998	MY1999	MY2000	MY2001	MY2002	MY2003	MY2004	MY2005	Ann Chg
Area Harvested	22700	23988	23670	24285	24520	24881	25183	25521	25885	26259	1.5%
Area Harvested Northeast	6062	6338	6276	6412	6477	6581	6647	6739	6835	6926	1.3%
Area Harvested North	7947	8481	8301	8545	8626	8745	8866	8985	9117	9251	1.5%
Area Harvested Northwest	2821	2937	2923	2989	3020	3063	3104	3145	3190	3236	1.4%
Area Harvested East	1120	1172	1135	1145	1132	1127	1120	1114	1111	1108	-.1%
Area Harvested Central	2355	2479	2455	2509	2522	2549	2567	2589	2612	2639	1.1%
Area Harvested South	2394	2580	2580	2686	2742	2817	2879	2948	3020	3099	2.6%
Yield	4.76	4.90	5.00	5.09	5.21	5.32	5.43	5.55	5.66	5.78	2.0%
Yield Northeast	5.81	6.01	6.16	6.29	6.47	6.62	6.79	6.95	7.12	7.29	2.3%
Yield North	5.06	5.20	5.30	5.39	5.50	5.61	5.72	5.82	5.93	6.04	1.8%
Yield Northwest	4.40	4.59	4.74	4.88	5.05	5.21	5.38	5.55	5.72	5.90	3.0%
Yield East	3.55	3.64	3.70	3.74	3.81	3.87	3.93	3.98	4.04	4.10	1.4%
Yield Central	3.45	3.53	3.57	3.61	3.66	3.71	3.76	3.80	3.85	3.90	1.2%
Yield South	3.37	3.43	3.46	3.48	3.52	3.55	3.59	3.62	3.65	3.69	.9%
Production	108000	117508	118392	123647	127816	132404	136839	141543	146574	151691	3.5%
Production Northeast	35222	38081	38656	40354	41880	43588	45112	46836	48656	50473	3.7%
Production North	40177	44093	43994	46026	47475	49040	50672	52311	54086	55887	3.4%
Production Northwest	12427	13479	13854	14586	15252	15959	16690	17444	18249	19082	4.4%
Production East	3983	4267	4195	4283	4314	4357	4398	4440	4491	4547	1.3%
Production Central	8135	8746	8772	9051	9240	9451	9642	9843	10058	10282	2.4%
Production South	8057	8842	8922	9347	9656	10010	10326	10669	11033	11421	3.6%
Beginning Stocks	27500	27000	27660	28003	28623	29101	29594	30061	30433	30745	1.1%
Net imports	500	-1129	3358	5577	8160	10887	13944	16535	18839	20812	45.2%
Imports*	2000	344	4725	6875	9398	12055	15049	17595	19868	21805	27.0%
Exports	1500	1473	1367	1298	1236	1168	1105	1060	1029	994	-4.0%
prxpco		-59	-24	-36	-17	-35	-29	-12	1	-11	
trend		-15	-15	-14	-13	-12	-11	-11	-10	-10	
prcpco		48	-67	-20	-32	-20	-22	-22	-23	-14	
Total change		-27	-106	-69	-62	-68	-63	-45	-32	-35	
Consumption Demand	109000	115719	121408	128603	135498	142798	150317	157705	165102	172289	4.7%
Food Demand	23500	23214	22849	22899	22824	22996	23127	23214	23302	23489	.0%
Feed Demand	85500	92505	98558	105705	112674	119803	127190	134490	141799	148799	5.7%
Other Demand	0	0	0	0	0	0	0	0	0	0	
Ending Stocks	27000	27660	28003	28623	29101	29594	30061	30433	30745	30959	1.4%
WB Import Number	400	700	1200	1400	2100	2500	3800	5200	6400	7300	33.7%
WB Export Number	7800	7700	6700	7000	5800	5000	4900	4800	4300	4000	-6.5%
Consistency Checks:											
End Stks/Consumption	24.8	23.9	23.1	22.3	21.5	20.7	20.0	19.3	18.6	18.0	-3.2%
Food/Consumption Dmd	21.6	20.1	18.8	17.8	16.8	16.1	15.4	14.7	14.1	13.6	-4.5%
Imps/Consumption Dmd	1.8	.3	3.9	5.3	6.9	8.4	10.0	11.2	12.0	12.7	21.3%
Exps/Production	1.4	1.3	1.2	1.0	1.0	.9	.8	.7	.7	.7	-7.2%
Per Cap Production	88.0	94.4	93.8	96.6	98.5	100.6	102.6	104.6	106.8	109.0	2.2%
Pct Change in Prodn	.0	8.8	.8	4.4	3.4	3.6	3.3	3.4	3.6	3.5	
Per Cap Total Cons	88.8	93.0	96.2	100.5	104.4	108.5	112.7	116.6	120.4	123.9	3.4%
Per Cap Food	19.1	18.7	18.1	17.9	17.6	17.5	17.3	17.2	17.0	16.9	-1.2%
Per Cap Feed	69.7	74.3	78.1	82.6	86.8	91.0	95.3	99.4	103.4	107.0	4.4%
Per Cap Other	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
Pct Change in Cons	4.8	6.2	4.9	5.9	5.4	5.4	5.3	4.9	4.7	4.4	

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COARSE GRAINS	BASE	MY1997	MY1998	MY1999	MY2000	MY2001	MY2002	MY2003	MY2004	MY2005	Ann Chg
Area Harvested	27857	29320	28846	29490	29679	30017	30290	30604	30949	31307	1.2%
Yield	4.37	4.50	4.60	4.68	4.80	4.90	5.00	5.11	5.22	5.33	2.0%
Production	121683	131961	132618	138084	142349	147059	151597	156414	161584	166841	3.2%
Beginning Stocks	27888	27399	28120	28461	29090	29575	30076	30550	30931	31250	1.1%
Imports	4100	2314	6819	9099	11761	14607	17790	20515	22957	25080	19.9%
Exports	1600	1558	1451	1381	1318	1249	1185	1140	1109	1073	-3.9%
Consumption Demand	124673	132838	138473	146003	153135	160750	168566	176250	183958	191476	4.4%
Food Demand	32737	33454	33162	33437	33543	34009	34423	34775	35130	35627	.8%
Feed Demand	91936	99384	105312	112567	119592	126741	134143	141475	148828	155849	5.4%
Other Demand	0	0	0	0	0	0	0	0	0	0	
Ending Stocks	27399	28120	28461	29090	29575	30076	30550	30931	31250	31473	1.4%
WB Import Number	1800	2100	2700	2900	3600	4000	5600	7100	8500	9600	18.2%
WB Export Number	8000	7900	6900	7200	6000	5200	5100	5000	4500	4200	-8.2%
Consistency Checks:											
End Stks/Consumption	22.0	21.2	20.6	19.9	19.3	18.7	18.1	17.5	17.0	16.4	-2.9%
Food/Consumption Dmd	26.3	25.2	23.9	22.9	21.9	21.2	20.4	19.7	19.1	18.6	-3.4%
Imps/Consumption Dmd	3.3	1.7	4.9	6.2	7.7	9.1	10.6	11.6	12.5	13.1	14.8%
Exps/Production	1.3	1.2	1.1	1.0	.9	.8	.8	.7	.7	.6	-6.9%
Per Cap Production	99.1	106.0	105.1	107.9	109.7	111.8	113.6	115.6	117.8	119.9	1.9%
Pct Change in Prodn	.0	6.4	.5	4.1	3.1	3.3	3.1	3.2	3.3	3.3	
Per Cap Total Cons	101.6	106.7	109.7	114.1	118.0	122.2	126.3	130.3	134.1	137.6	3.1%
Per Cap Food	26.7	26.9	26.3	26.1	25.8	25.8	25.8	25.7	25.6	25.6	-.4%
Per Cap Food ex BA	23.8	24.0	23.3	23.0	22.6	22.4	22.3	22.0	21.8	21.7	-.9%
PC Food ex BA Urban	23.8	24.3	23.5	23.2	22.7	22.5	22.1	21.8	21.4	21.2	-1.1%
prcpwh		.3	.0	.1	.1	.0	.1	.0	.0	.0	
prcpri		.2	.1	.0	.1	.1	.1	.1	.1	.0	
prcpcg		.4	-.6	-.2	-.3	-.2	-.2	-.2	-.2	-.1	
prcpba		.0	.0	.0	.0	.0	.0	.0	.0	.0	
pcdgdpur		-.2	-.2	-.2	-.2	-.1	-.1	-.1	-.1	-.1	
crpcfgtour		-.2	-.2	-.1	-.2	.0	-.1	-.1	-.1	-.1	
Total change		.5	-.8	-.3	-.5	-.3	-.3	-.4	-.3	-.2	
PC Food ex BA Rural	23.8	23.8	23.2	22.9	22.5	22.4	22.3	22.1	22.0	21.9	-.8%
prcpwh		.1	.0	.0	.1	.0	.0	.0	.0	.0	
prcpri		.1	.1	.0	.0	.0	.0	.0	.0	.0	
prcpcg		.2	-.3	-.1	-.1	-.1	-.1	-.1	-.1	-.1	
prcpba		.0	.0	.0	.0	.0	.0	.0	.0	.0	
pcdgdpru		.0	.0	.0	.0	.0	.0	.0	.0	.0	
crpcfgtoru		-.4	-.5	-.3	-.3	-.1	-.1	-.1	-.1	-.1	
Total change		.0	-.6	-.3	-.4	-.1	-.1	-.2	-.2	-.1	
Per Cap Feed	74.9	79.9	83.4	88.0	92.2	96.3	100.5	104.6	108.5	112.0	4.1%
Per Cap Other	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
Pct Change in Cons	4.2	6.5	4.2	5.4	4.9	5.0	4.9	4.6	4.4	4.1	

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PORK	BASE	CY1998	CY1999	CY2000	CY2001	CY2002	CY2003	CY2004	CY2005	CY2006	Ann Chg
	Price exog-	0 (0=off;1=on)									
Slaughter*	515464	553419	582231	617957	651378	685633	720455	754034	787482	821335	4.8%
Yield	79.00	79.71	80.43	81.15	81.88	82.62	83.36	84.11	84.87	85.63	.8%
Production	40722	44114	46828	50149	53337	56647	60059	63424	66834	70334	5.6%
Production Region 1	2922	3165	3360	3598	3827	4064	4309	4551	4795	5046	5.6%
Production Region 2	7734	8378	8893	9524	10130	10758	11406	12045	12693	13358	5.6%
Production Region 3	2093	2267	2407	2577	2741	2911	3087	3260	3435	3615	5.6%
Production Region 4	5512	5972	6339	6789	7220	7668	8130	8586	9047	9521	5.6%
Production Region 5	14386	15584	16543	17716	18843	20012	21218	22407	23611	24848	5.6%
Production Region 6	8075	8747	9286	9944	10576	11232	11909	12576	13253	13947	5.6%
Imports	0	0	0	0	0	0	0	0	0	0	
Exports	222	243	260	274	282	288	290	285	276	261	1.6%
prexpk		-17	-24	-26	-27	-23	-23	-23	-22	-21	
pcdgdp		86	91	94	95	93	91	88	82	76	
pcincome		-54	-58	-63	-65	-68	-69	-70	-68	-66	
mtexpkto(-1)		5	10	8	6	4	2	1	-2	-4	
Total change		21	18	13	8	6	2	-5	-9	-15	
Consumption	40500	43871	46568	49875	53055	56359	59770	63139	66558	70073	5.6%
WB Export Number	225	229	235	239	243	248	253	259	264	268	
Consistency Checks											
Per Cap Production	33.2	35.4	37.1	39.2	41.1	43.1	45.0	46.9	48.7	50.6	4.3%
Pct Change in Prodn	4.4	8.3	6.2	7.1	6.4	6.2	6.0	5.6	5.4	5.2	1.7%
Per Cap Consumption	33.0	35.2	36.9	39.0	40.9	42.8	44.8	46.7	48.5	50.4	4.3%
PC Consumption Urban	33.0	33.9	34.1	34.6	34.9	35.4	35.8	36.1	36.5	36.8	1.1%
prcpbv		.0	.0	.0	.0	.0	.0	.0	.0	.0	
prcpmk		.1	.1	.1	.1	.1	.1	.1	.1	.1	
prcppk		-.9	-1.1	-1.0	-1.1	-.9	-1.0	-1.0	-.9	-.9	
prcplm		.0	.0	.0	.0	.0	.0	.0	.0	.0	
prcpfh		.0	.0	.0	.0	.0	.0	.0	.0	.0	
prcppl		.0	.1	.1	.1	.0	.0	.0	.0	.0	
prcpeg		.0	.1	.1	.1	.0	.0	.0	.0	.0	
pcdgdpur		1.1	1.1	1.1	1.0	1.0	1.0	.9	.9	.9	
mtpcmttour		.5	-.1	.2	.0	.2	.1	.1	.1	.1	
Total change		.9	.2	.5	.3	.5	.4	.3	.4	.3	
PC Consumption Rural	33.0	35.8	38.0	40.8	43.4	46.0	48.7	51.3	53.9	56.5	5.5%
prcpbv		.0	.0	.0	.0	.0	.0	.0	.1	.1	
prcpmk		.1	.1	.1	.1	.1	.1	.1	.1	.1	
prcppk		-.9	-1.2	-1.2	-1.3	-1.2	-1.2	-1.3	-1.3	-1.4	
prcplm		.0	.0	.0	.0	.0	.0	.0	.0	.0	
prcpfh		.0	.0	.0	.0	.0	.0	.1	.1	.1	
prcppl		.0	.1	.1	.1	.1	.1	.1	.1	.1	
prcpeg		.0	.1	.1	.1	.1	.1	.1	.1	.1	
pcdgdpru		1.1	1.1	1.2	1.2	1.2	1.3	1.3	1.3	1.3	
mtpcmttoru		2.4	2.0	2.4	2.3	2.2	2.3	2.3	2.2	2.3	
Total change		2.8	2.3	2.8	2.6	2.6	2.7	2.6	2.6	2.6	
Pct Change in Cons	4.4	8.3	6.1	7.1	6.4	6.2	6.1	5.6	5.4	5.3	1.8%
Imports/Consumption	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
Exports/Production	.5	.5	.6	.5	.5	.5	.5	.4	.4	.4	-3.8%

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POULTRY	BASE	CY1998	CY1999	CY2000	CY2001	CY2002	CY2003	CY2004	CY2005	CY2006	Ann Chg
	Price exog-	0 (0 = off;1 = on)									
Production	8756	9889	10809	11970	13136	14378	15690	17042	18436	19946	8.6%
prpppl		158	287	257	298	282	308	330	336	338	
prcpco		70	-112	-39	-74	-54	-68	-79	-92	-63	
prcpri		-6	-4	-2	-3	-5	-4	-5	-4	-4	
prcpsm		-13	-3	-4	-11	-1	-5	-12	-5	-21	
mtdmplto		925	752	950	956	1018	1082	1118	1158	1260	
Total change		1133	919	1161	1186	1240	1314	1352	1394	1510	
Production Region 1	872	984	1076	1192	1308	1431	1562	1696	1835	1986	8.6%
Production Region 2	2055	2321	2536	2809	3082	3373	3682	3999	4326	4680	8.6%
Production Region 3	186	210	230	255	279	306	334	362	392	424	8.6%
Production Region 4	1827	2064	2256	2498	2741	3000	3274	3556	3847	4162	8.6%
Production Region 5	1530	1728	1888	2091	2295	2511	2741	2977	3220	3484	8.6%
Production Region 6	2287	2583	2823	3126	3431	3754	4098	4451	4815	5209	8.6%
Imports	170	193	219	250	287	331	383	446	521	613	13.7%
Exports	301	318	335	352	371	390	409	429	449	470	4.6%
Consumption	8625	9764	10693	11867	13052	14317	15664	17059	18508	20089	8.8%
WB Export Number											
WB Import Number											
Consistency Checks:											
Per Cap Production	7.1	7.9	8.6	9.4	10.1	10.9	11.8	12.6	13.4	14.3	7.2%
Pct Change in Prodn	12.6	12.9	9.3	10.7	9.7	9.4	9.1	8.6	8.2	8.2	-4.3%
Per Cap Consumption	7.0	7.8	8.5	9.3	10.1	10.9	11.7	12.6	13.5	14.4	7.5%
PC Consumption Urban	7.0	7.6	7.9	8.3	8.7	9.1	9.5	9.9	10.3	10.7	4.3%
prcpbv		.0	.0	.0	.0	.0	.0	.0	.0	.0	
prcpmk		.0	.0	.0	.0	.0	.0	.0	.0	.0	
prcppk		.1	.1	.1	.1	.1	.1	.1	.1	.1	
prcplm		.0	.0	.0	.0	.0	.0	.0	.0	.0	
prcpfh		.0	.0	.0	.0	.0	.0	.0	.0	.0	
prcppl		-.3	-.5	-.4	-.5	-.4	-.4	-.5	-.4	-.4	
prcpeg		.0	.0	.0	.0	.0	.0	.0	.0	.0	
pcdgdpur		.6	.6	.6	.6	.6	.6	.6	.6	.6	
mtpcmttour		.1	.0	.0	.0	.0	.0	.0	.0	.0	
Total change		.6	.3	.4	.4	.4	.4	.4	.4	.4	
PC Consumption Rural	7.0	8.0	8.7	9.7	10.7	11.7	12.7	13.8	14.9	16.1	8.7%
prcpbv		.0	.0	.0	.0	.0	.0	.0	.0	.0	
prcpmk		.0	.0	.0	.0	.0	.0	.0	.1	.1	
prcppk		.1	.1	.1	.2	.2	.2	.2	.2	.2	
prcplm		.0	.0	.0	.0	.0	.0	.0	.0	.0	
prcpfh		.0	.0	.0	.0	.0	.0	.0	.0	.0	
prcppl		-.3	-.5	-.5	-.6	-.5	-.6	-.6	-.6	-.6	
prcpeg		.0	.0	.0	.0	.0	.0	.0	.0	.0	
pcdgdpru		.6	.6	.7	.7	.7	.8	.8	.8	.9	
mtpcmttoru		.5	.4	.6	.6	.5	.6	.6	.6	.6	
Total change		1.0	.8	1.0	1.0	1.0	1.1	1.1	1.1	1.2	
Pct Change in Cons	12.6	13.2	9.5	11.0	10.0	9.7	9.4	8.9	8.5	8.5	-3.8%
Imports/Consumption	2.0	2.0	2.0	2.1	2.2	2.3	2.4	2.6	2.8	3.1	4.4%
Exports/Production	3.4	3.2	3.1	2.9	2.8	2.7	2.6	2.5	2.4	2.4	-3.7%

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REFERENCE PRICES (PRRP	UNITS	MY1980	MY1981	MY1982	MY1983	MY1984	MY1985	MY1986	MY1987	MY1988	MY1989	MY1990	MY1992	MY1993	MY1994	MY1995	MY1996	BASE
Cattle (CY1991-2005)	CUS$/Ton	1845	1385	1602	1630	1305	1212	1327	1538	1531	1432	1360	1255	1143	987	952	800	796
Beef and veal (CY1991-2	CUS$/Ton	2735	2940	2740	2666	2375	1975	2034	1961	2004	2078	1920	1861	1889	1718	1621	1358	1352
Milk (CY1991-2005)	CUS$/Ton	0	0	207	173	138	114	117	130	203	235	172	163	188	179	171	163	155
Pork (CY1991-2005)	CUS$/Ton	5618	5161	5051	4532	4385	5774	5826	5595	4947	4896	4633	4698	5141	5325	5103	5047	5100
Lamb and mutton (CY19	CUS$/Ton	3956	3239	2519	2406	2211	2385	2459	2631	2423	2671	2227	2384	2509	2940	3805	4144	3852
Wool (CY1991-2005)	CUS$/Ton	4713	4139	3503	3506	3103	2778	3888	6183	5435	4467	2961	2835	2204	2583	3342	3640	3383
Fish	CUS$/Ton																	
Shrimp	CUS$/Ton																	
Poultry (CY1991-2005)	CUS$/Ton	1539	1384	1444	1524	1345	1466	1183	1353	1357	1208	1104	1086	1116	1103	1019	950	950
Eggs (CY1991-2005)	CUS$/Ton	1570	1416	1460	1503	1190	1241	1043	1012	1277	1228	1115	915	893	903	862	820	842
Wheat	CUS$/Ton	274	241	212	196	183	124	83	96	157	154	81	97	96	91	114	92	92
Rice	CUS$/Ton	722	511	357	340	282	249	211	296	313	289	281	264	217	245	250	248	230
Corn	CUS$/Ton	209	156	159	182	143	117	82	104	122	111	102	102	89	101	92	105	101
Sorghum	CUS$/Ton	209	156	160	161	132	108	83	98	114	107	101	102	87	102	102	103	98
Barley	CUS$/Ton	181	142	100	145	118	83	76	91	114	104	96	95	90	86	83	89	86
Cotton	CUS$/Ton	3071	2253	2233	2446	1858	1273	1572	1773	1555	1846	1787	1318	1177	1412	1798	1656	1403
Sugar	CUS$/Ton	757	691	288	218	168	98	150	153	217	265	293	192	187	191	219	252	191
Soybeans	CUS$/Ton	459	348	339	380	284	248	239	312	309	250	235	224	227	234	219	230	221
Groundnuts	CUS$/Ton	1235	1235	1162	1232	863	1008	954	1090	863	985	1496	771	883	982	842	862	850
Sunflower Seed	CUS$/Ton	488	409	353	453	346	252	234	304	282	270	259	255	255	286	273	257	252
Rapeseed	CUS$/Ton	452	401	398	441	367	281	206	244	231	215	193	193	216	256	255	227	222
Soybean Meal	CUS$/Ton	400	308	294	278	188	216	217	279	273	206	193	191	191	182	163	184	181
Groundnut Meal	CUS$/Ton	404	295	282	265	178	193	179	219	216	189	151	144	147	159	142	151	150
Sunflowerseed Meal	CUS$/Ton	317	242	206	194	102	131	136	163	156	124	110	116	124	115	91	117	115
Rapeseed Meal	CUS$/Ton	301	255	223	206	115	139	108	168	176	138	127	131	145	137	118	137	133
Cottonseed Meal	CUS$/Ton	332	269	226	219	120	135	158	175	175	156	135	129	143	142	125	127	123
Fish meal (CY1991-2005	CUS$/Ton	671	478	588	464	336	375	434	594	427	412	460	451	358	327	393	364	383
Copra meal (CY1991-20	CUS$/Ton	294	255	238	216	159	155	158	182	172	127	129	136	121	121	126	134	135
Soybean Oil	CUS$/Ton	801	635	608	908	757	443	370	488	459	443	441	412	418	524	567	457	448
Groundnut Oil	CUS$/Ton	1632	915	772	1302	1107	757	583	630	745	929	948	605	621	879	914	727	717
Sunflowerseed Oil	CUS$/Ton	978	764	658	962	790	478	404	494	503	491	467	433	454	566	610	492	481
Rapeseed Oil	CUS$/Ton	749	601	572	875	710	398	339	449	431	427	405	392	407	522	563	446	437
Cottonseed Oil	CUS$/Ton	978	799	802	1061	924	603	561	644	598	657	597	514	634	676	676	600	578
Coconut oil (CY1991-20	CUS$/Ton	819	632	949	1437	708	546	501	616	539	338	417	541	414	545	752	508	503
Palm oil (CY1991-2005)	CUS$/Ton	826	653	630	822	683	324	361	467	398	283	317	359	355	404	568	463	388
Urea (CY1991-2005)	CUS$/Ton	312	216	162	213	164	125	133	169	143	157	166	131	98	133	143	146	154
Potash fert (CY1991-200	CUS$/Ton	163	113	98	104	101	80	77	95	103	98	105	105	99	95	103	106	112
Phosphate fert (CY1991-	CUS$/Ton	231	189	174	163	146	142	157	173	151	132	128	113	103	119	120	124	133

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REFERENCE PRICES (PRRP	MY1997	MY1998	MY1999	MY2000	MY2001	MY2002	MY2003	MY2004	MY2005	Ann Chg
Cattle (CY1991-2005)	795	810	809	830	833	830	828	821	815	.3%
Beef and veal (CY1991-2	1350	1376	1374	1410	1416	1411	1406	1395	1383	.3%
Milk (CY1991-2005)	150	145	139	134	129	125	120	116	111	-3.6%
Pork (CY1991-2005)	5093	5055	4997	4947	4904	4867	4827	4784	4742	-.8%
Lamb and mutton (CY19	3446	3261	3331	3442	3450	3379	3308	3271	3259	-1.8%
Wool (CY1991-2005)	3027	2864	2926	3024	3031	2968	2906	2874	2863	-1.8%
Fish										
Shrimp										
Poultry (CY1991-2005)	991	1014	994	972	940	921	905	887	869	-1.0%
Eggs (CY1991-2005)	831	819	808	792	777	762	746	730	718	-1.8%
Wheat	88	88	89	93	91	90	88	87	86	-.8%
Rice	238	237	232	228	225	220	218	214	207	-1.2%
Corn	96	94	91	89	86	83	81	81	79	-2.6%
Sorghum	93	91	88	86	83	80	78	78	76	-2.7%
Barley	82	80	77	76	73	70	69	69	67	-2.6%
Cotton	1321	1290	1335	1310	1247	1202	1176	1152	1127	-2.4%
Sugar	190	191	189	188	186	183	181	178	176	-.9%
Soybeans	216	209	197	193	187	181	178	174	173	-2.7%
Groundnuts	822	815	802	788	782	769	758	746	735	-1.6%
Sunflower Seed	241	228	215	211	208	204	202	199	196	-2.7%
Rapeseed	210	189	178	175	176	180	183	183	187	-1.9%
Soybean Meal	179	179	170	164	156	147	143	138	135	-3.2%
Groundnut Meal	146	145	136	130	123	114	109	104	101	-4.3%
Sunflowerseed Meal	114	116	110	107	101	97	98	95	93	-2.3%
Rapeseed Meal	131	128	121	117	111	110	111	107	105	-2.6%
Cottonseed Meal	117	124	110	104	100	97	94	89	86	-3.9%
Fish meal (CY1991-2005	365	357	349	341	333	318	303	288	272	-3.2%
Copra meal (CY1991-20	135	134	128	125	121	119	120	117	117	-1.6%
Soybean Oil	424	379	357	351	357	362	364	368	371	-2.1%
Groundnut Oil	668	598	551	530	513	505	496	491	486	-4.2%
Sunflowerseed Oil	454	404	381	375	376	377	381	387	392	-2.2%
Rapeseed Oil	410	363	342	337	344	352	357	365	373	-1.7%
Cottonseed Oil	549	508	483	470	471	472	474	477	483	-2.0%
Coconut oil (CY1991-20	481	399	383	389	409	421	433	445	456	-1.1%
Palm oil (CY1991-2005)	339	321	308	310	324	334	344	353	362	-.8%
Urea (CY1991-2005)	156	161	165	167	169	171	172	174	176	1.5%
Potash fert (CY1991-200	115	118	121	124	125	126	128	129	131	1.7%
Phosphate fert (CY1991-	136	141	145	148	149	151	153	155	158	1.9%

Projections of Selected Agricultural Products in Scenario 5

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\WHEAT	BASE	MY1997	MY1998	MY1999	MY2000	MY2001	MY2002	MY2003	MY2004	MY2005	Ann Chg
TOTAL GRAIN PRODUCTION	347925	356543	361821	371522	381166	391401	401201	411711	422705	433909	2.2%
TOTAL GRAIN CONSUMPTION	359197	377142	386418	398446	409547	425708	441923	458097	475357	493654	3.2%
TOTAL GRAIN IMPORTS	16978	18483	22669	26398	29112	35464	42300	49180	56266	63524	14.1%
Area Harvested	29000	27070	28065	27872	28053	28279	28241	28311	28310	28339	-.2%
Area Harvested Northeast	1425	1322	1372	1351	1359	1367	1360	1360	1356	1352	-.5%
Area Harvested North	12663	11747	12165	12073	12158	12256	12247	12281	12282	12294	-.3%
Area Harvested Northwest	5393	5204	5347	5352	5401	5456	5478	5513	5540	5570	.3%
Area Harvested East	4465	4053	4219	4154	4149	4157	4110	4087	4049	4020	-1.0%
Area Harvested Central	3760	3536	3679	3655	3674	3700	3691	3696	3692	3694	-.2%
Area Harvested South	1294	1208	1283	1285	1313	1342	1355	1374	1390	1409	.9%
Yield	3.42	3.43	3.53	3.60	3.70	3.78	3.86	3.94	4.03	4.11	1.9%
Yield Northeast	2.45	2.47	2.54	2.58	2.65	2.71	2.77	2.83	2.89	2.96	1.9%
Yield North	4.02	4.04	4.16	4.25	4.36	4.46	4.56	4.66	4.76	4.87	1.9%
Yield Northwest	2.67	2.69	2.76	2.82	2.90	2.97	3.03	3.10	3.16	3.23	1.9%
Yield East	3.72	3.74	3.85	3.93	4.03	4.13	4.22	4.31	4.40	4.50	1.9%
Yield Central	2.99	3.01	3.09	3.16	3.24	3.32	3.39	3.46	3.54	3.62	1.9%
Yield South	1.92	1.93	1.99	2.03	2.09	2.14	2.18	2.23	2.28	2.33	1.9%
Production	99180	92868	98981	100432	103671	106915	109026	111648	114006	116544	1.6%
Production Northeast	3495	3258	3479	3492	3603	3709	3769	3853	3926	3998	1.4%
Production North	50937	47507	50587	51332	53037	54719	55860	57243	58491	59820	1.6%
Production Northwest	14408	13978	14768	15114	15647	16180	16595	17067	17522	18001	2.3%
Production East	16612	15160	16227	16334	16736	17164	17338	17617	17834	18091	.9%
Production Central	11240	10628	11367	11546	11908	12276	12510	12803	13066	13356	1.7%
Production South	2489	2336	2552	2614	2739	2866	2955	3064	3166	3279	2.8%
		13777	14440	14800	15100	15400	15818	16624	17212	17854	
Beginning Stocks	14157	19250	19248	19810	19966	20078	20615	20994	21412	21773	4.4%
Imports*	12000	14447	13331	13673	12372	14045	15429	16803	18072	19180	4.8%
Exports	0	0	0	0	0	0	0	0	0	0	
Consumption Demand	106087	107318	111749	113949	115932	120424	124078	128032	131717	135379	2.5%
Food Demand	102787	103854	108110	110115	111907	116183	119810	123330	126767	130176	2.4%
Food Demand Urban	15952	15636	17436	18168	18806	20331	21483	22898	24143	25366	4.7%
Food Demand Rural	86835	88218	90675	91947	93101	95851	98127	100432	102624	104810	1.9%
Feed Demand	3300	3464	3639	3834	4025	4241	4466	4703	4949	5202	4.7%
Other Demand	0	0	0	0	0	0	0	0	0	0	
Ending Stocks	19250	19248	19810	19966	20078	20615	20994	21412	21773	22119	1.4%
WB Import Number	12000	13777	14440	14800	15100	15400	15818	16624	17212	18154	4.2%
Baseline-WB Difference	0	670	-1109	-1127	-2728	-1355	-389	179	860	1026	
Consistency Checks:											
End Stks/Consumption	18.1	17.9	17.7	17.5	17.3	17.1	16.9	16.7	16.5	16.3	-1.0%
Imps/Consumption Dmd	11.3	13.5	11.9	12.0	10.7	11.7	12.4	13.1	13.7	14.2	2.3%
Per Cap Production	80.8	74.9	79.1	79.5	81.3	83.1	84.0	85.3	86.5	87.8	.8%
Per Cap Total Cons	86.4	86.6	89.3	90.2	90.9	93.6	95.6	97.8	99.9	102.0	1.7%
Per Cap Food	83.7	83.8	86.4	87.1	87.7	90.3	92.1	94.2	96.1	98.0	1.6%
Per Cap Food Urban	45.1	43.4	47.6	48.7	49.6	52.7	54.7	57.4	59.6	61.7	3.2%
prcpwh		-5.4	.0	-2.0	-2.4	-.6	-1.4	-1.1	-1.4	-1.3	
prcpri		1.8	1.1	.5	.7	1.0	.8	1.0	.8	.7	
prcpcg		-.7	1.2	.8	.9	.7	.9	1.0	1.1	1.0	
prcpba		.5	.0	.0	.0	.0	.0	.0	.0	.0	
pcdgdpur		2.4	2.2	2.2	2.1	2.0	2.0	2.0	1.9	1.9	
crpcfgtour		-.4	-.4	-.2	-.4	-.1	-.2	-.3	-.2	-.2	
Total change		-1.7	4.1	1.1	.8	3.1	2.1	2.7	2.2	2.1	
Per Cap Food Rural	102.0	100.3	102.4	103.2	103.9	106.4	108.3	110.4	112.3	114.3	1.1%
prcpwh		-2.8	.0	-1.0	-1.2	-.3	-.6	-.5	-.6	-.6	
prcpri		.4	.3	.1	.1	.2	.2	.2	.1	.1	
prcpcg		-.8	1.4	.6	.9	.8	.9	1.0	1.1	.9	
prcpba		.6	.0	.0	.0	.0	.0	.0	.0	.0	
pcdgdpru		2.6	2.4	2.3	2.2	2.1	2.0	1.9	1.8	1.7	
crpcfgtoru		-1.8	-2.0	-1.3	-1.4	-.3	-.4	-.6	-.5	-.2	
Total change		-1.7	2.1	.8	.7	2.5	2.0	2.0	2.0	2.0	
Per Cap Feed	2.7	2.8	2.9	3.0	3.2	3.3	3.4	3.6	3.8	3.9	3.8%

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RICE	BASE	MY1997	MY1998	MY1999	MY2000	MY2001	MY2002	MY2003	MY2004	MY2005	Ann Chg
Area Harvested	30544	30735	29813	29778	29603	29443	29408	29296	29224	29084	-.5%
Area Harvested Northeast	1876	1870	1873	1834	1813	1788	1764	1741	1717	1690	-1.0%
Area Harvested North	766	773	768	756	748	737	729	720	712	702	-.9%
Area Harvested Northwest	370	375	375	374	373	371	371	370	369	368	-.1%
Area Harvested East	6606	6643	6395	6301	6166	6038	5940	5830	5726	5614	-1.6%
Area Harvested Central	12451	12489	12076	12082	12017	11961	11954	11912	11887	11834	-.5%
Area Harvested South	8475	8585	8327	8430	8487	8549	8650	8723	8813	8876	.5%
Yield	4.16	4.28	4.35	4.43	4.50	4.58	4.65	4.73	4.80	4.88	1.6%
Yield Northeast	3.92	4.04	4.08	4.14	4.20	4.26	4.32	4.38	4.43	4.49	1.4%
Yield North	4.64	4.78	4.83	4.90	4.97	5.04	5.11	5.18	5.25	5.32	1.4%
Yield Northwest	3.76	3.87	3.92	3.97	4.03	4.08	4.14	4.19	4.25	4.31	1.4%
Yield East	4.55	4.68	4.76	4.85	4.94	5.03	5.11	5.20	5.29	5.38	1.7%
Yield Central	4.37	4.50	4.57	4.66	4.75	4.83	4.91	5.00	5.08	5.17	1.7%
Yield South	3.58	3.69	3.75	3.82	3.89	3.95	4.02	4.09	4.16	4.23	1.7%
Production	127062	131628	129682	131920	133309	134725	136750	138474	140312	141812	1.1%
Production Northeast	7361	7550	7648	7596	7615	7611	7613	7616	7612	7592	.3%
Production North	3557	3691	3710	3706	3714	3711	3723	3729	3733	3733	.5%
Production Northwest	1391	1451	1467	1484	1500	1515	1533	1550	1567	1583	1.3%
Production East	30040	31113	30445	30591	30463	30343	30371	30332	30297	30197	.1%
Production Central	54388	56186	55221	56341	57026	57740	58709	59535	60414	61142	1.2%
Production South	30324	31637	31192	32201	32990	33804	34800	35712	36690	37566	2.2%
Beginning Stocks	18724	17829	13543	9243	6377	4861	3217	2015	1897	2478	-18.3%
Imports	878	927	965	1004	1043	1089	1137	1175	1224	1284	3.9%
prcpri		26	17	8	10	16	12	16	11	11	
prmpri		7	5	15	11	12	18	3	19	29	
trend		15	16	17	17	18	18	19	19	20	
Total change		49	38	40	39	45	48	38	50	60	
Exports	398	575	609	700	791	895	1035	1176	1349	1541	14.5%
prexri		16	14	16	16	22	26	18	33	47	
crprrito		74	-44	54	38	43	69	67	81	74	
pcdgdp		9	13	14	16	18	20	24	27	31	
crexrito(-1)		79	51	7	21	21	24	32	32	40	
Total change		177	35	91	91	104	140	142	173	192	
Consumption Demand	128437	136266	134338	135090	135077	136562	138054	138590	139606	140948	.9%
Food Demand	128437	136266	134338	135090	135077	136562	138054	138590	139606	140948	.9%
Feed Demand	0	0	0	0	0	0	0	0	0	0	
Other Demand	0	0	0	0	0	0	0	0	0	0	
Ending Stocks*	17829	13543	9243	6377	4861	3217	2015	1897	2478	3085	-16.1%
WB Import Number	400	400	500	500	600	600	600	700	700	800	7.2%
WB Export Number	800	1000	800	800	1100	1300	1400	1400	1600	1700	7.8%
Consistency Checks:											
End Stks/Consumption	13.9	9.9	6.9	4.7	3.6	2.4	1.5	1.4	1.8	2.2	-16.9%
Food/Consumption Dmd	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	.0%
Imps/Consumption Dmd	.7	.7	.7	.7	.8	.8	.8	.8	.9	.9	2.9%
Exps/Production	.3	.4	.5	.5	.6	.7	.8	.8	1.0	1.1	13.3%
Per Cap Production	103.5	106.2	103.6	104.4	104.5	104.7	105.3	105.8	106.4	106.8	.3%
Pct Change in Prodn	1.4	3.6	-1.5	1.7	1.1	1.1	1.5	1.3	1.3	1.1	
Per Cap Total Cons	104.6	109.9	107.3	106.9	105.9	106.1	106.3	105.9	105.9	106.2	.1%
Per Cap Food	104.6	109.9	107.3	106.9	105.9	106.1	106.3	105.9	105.9	106.2	.1%
Per Cap Food Urban	55.0	55.5	55.7	57.0	57.7	58.4	59.3	59.7	60.4	61.2	1.1%
prcpwh		1.0	.0	.3	.4	.1	.2	.2	.2	.2	
prcpri		-1.6	-1.0	-.4	-.6	-.9	-.6	-.8	-.6	-.5	
prcpcg		-.2	.4	.2	.3	.2	.3	.3	.3	.3	
prcpba		.4	.0	.0	.0	.0	.0	.0	.0	.0	
pcdgdpur		1.8	1.7	1.6	1.6	1.5	1.4	1.3	1.3	1.2	
crpcfgtour		-.9	-1.0	-.4	-.9	-.2	-.4	-.6	-.5	-.4	
Total change		.5	.2	1.3	.8	.7	.8	.4	.8	.8	

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RICE	BASE	MY1997	MY1998	MY1999	MY2000	MY2001	MY2002	MY2003	MY2004	MY2005	Ann Chg
Per Cap Food Rural	134.0	132.2	128.7	127.8	126.3	126.5	126.7	126.2	126.0	126.3	-.6%
prcpwh		1.1	.0	.4	.4	.1	.2	.2	.2	.2	
prcpri		-2.2	-1.4	-.6	-.7	-1.1	-.8	-1.0	-.7	-.6	
prcpcg		-.2	.3	.1	.2	.2	.2	.2	.2	.2	
prcpba		1.0	.1	.0	.0	.0	.0	.0	.1	.0	
pcdgdpru		3.3	2.8	2.4	2.1	1.8	1.6	1.4	1.2	1.0	
crpcfgtoru		-4.8	-5.3	-3.2	-3.6	-.7	-1.0	-1.4	-1.2	-.5	
Total change		-1.8	-3.5	-.9	-1.5	.2	.2	-.6	-.1	.3	
Per Cap Feed	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
Per Cap Other	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
Pct Change in Cons	.3	6.1	-1.4	.6	.0	1.1	1.1	.4	.7	1.0	

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CORN	BASE	MY1997	MY1998	MY1999	MY2000	MY2001	MY2002	MY2003	MY2004	MY2005	Ann Chg
Area Harvested	22700	23989	23727	24395	24709	25150	25562	26025	26536	27079	1.8%
Area Harvested Northeast	6062	6340	6294	6441	6527	6648	6740	6861	6990	7120	1.6%
Area Harvested North	7947	8481	8321	8585	8693	8842	9003	9167	9352	9548	1.9%
Area Harvested Northwest	2821	2937	2927	2997	3034	3083	3133	3184	3240	3299	1.6%
Area Harvested East	1120	1172	1137	1149	1140	1139	1137	1138	1141	1146	.2%
Area Harvested Central	2355	2479	2460	2520	2542	2577	2607	2642	2681	2725	1.5%
Area Harvested South	2394	2580	2588	2704	2773	2862	2942	3033	3132	3242	3.1%
Yield	4.76	4.90	5.01	5.11	5.24	5.36	5.49	5.62	5.76	5.90	2.2%
Yield Northeast	5.81	6.01	6.17	6.32	6.50	6.68	6.86	7.05	7.24	7.45	2.5%
Yield North	5.06	5.20	5.31	5.40	5.53	5.65	5.78	5.90	6.04	6.17	2.0%
Yield Northwest	4.40	4.59	4.75	4.90	5.08	5.25	5.43	5.62	5.82	6.03	3.2%
Yield East	3.55	3.64	3.70	3.76	3.83	3.90	3.97	4.04	4.12	4.19	1.7%
Yield Central	3.45	3.53	3.58	3.62	3.68	3.74	3.80	3.86	3.92	3.98	1.4%
Yield South	3.37	3.43	3.46	3.49	3.54	3.58	3.63	3.67	3.72	3.77	1.1%
Production	108000	117585	118881	124632	129488	134866	140337	146281	152815	159698	4.0%
Production Northeast	35222	38111	38828	40677	42431	44379	46231	48345	50641	53010	4.2%
Production North	40177	44119	44174	46403	48105	49976	52004	54116	56464	58941	3.9%
Production Northwest	12427	13487	13896	14675	15406	16192	17025	17905	18863	19879	4.8%
Production East	3983	4269	4210	4314	4368	4439	4513	4595	4695	4807	1.9%
Production Central	8135	8751	8806	9122	9361	9631	9896	10186	10504	10851	2.9%
Production South	8057	8847	8968	9442	9817	10250	10668	11133	11646	12210	4.2%
Beginning Stocks	27500	27000	27822	28406	29339	30198	31159	32190	33223	34299	2.2%
Net imports	500	-367	4861	8120	11978	16442	21657	26913	32449	38274	54.3%
Imports*	2000	1098	6212	9393	13181	17567	22709	27909	33402	39180	34.6%
Exports	1500	1465	1352	1274	1203	1125	1052	996	953	906	-4.9%
prxpco		-59	-24	-35	-17	-34	-28	-11	1	-11	
trend		-15	-15	-14	-13	-12	-11	-10	-10	-9	
prcpco		40	-74	-29	-41	-32	-34	-34	-35	-28	
Total change		-35	-113	-78	-71	-78	-73	-56	-43	-47	
Consumption Demand	109000	116396	123157	131819	140607	150348	160963	172161	184188	196892	6.1%
Food Demand	23500	23085	22600	22509	22306	22314	22264	22152	22021	21960	-.7%
Feed Demand	85500	93311	100558	109310	118301	128033	138699	150009	162167	174932	7.4%
Other Demand	0	0	0	0	0	0	0	0	0	0	
Ending Stocks	27000	27822	28406	29339	30198	31159	32190	33223	34299	35380	2.7%
WB Import Number	400	700	1200	1400	2100	2500	3800	5200	6400	7300	33.7%
WB Export Number	7800	7700	6700	7000	5800	5000	4900	4800	4300	4000	-6.5%
Consistency Checks:											
End Stks/Consumption	24.8	23.9	23.1	22.3	21.5	20.7	20.0	19.3	18.6	18.0	-3.2%
Food/Consumption Dmd	21.6	19.8	18.4	17.1	15.9	14.8	13.8	12.9	12.0	11.2	-6.4%
Imps/Consumption Dmd	1.8	.9	5.0	7.1	9.4	11.7	14.1	16.2	18.1	19.9	26.9%
Exps/Production	1.4	1.2	1.1	1.0	.9	.8	.7	.7	.6	.6	-8.6%
Per Cap Production	88.0	94.9	95.0	98.6	101.5	104.8	108.1	111.8	115.9	120.3	3.2%
Pct Change in Prodn	.0	8.9	1.1	4.8	3.9	4.2	4.1	4.2	4.5	4.5	
Per Cap Total Cons	88.8	93.9	98.4	104.3	110.2	116.8	124.0	131.6	139.7	148.3	5.3%
Per Cap Food	19.1	18.6	18.1	17.8	17.5	17.3	17.2	16.9	16.7	16.5	-1.5%
Per Cap Feed	69.7	75.3	80.3	86.5	92.7	99.5	106.8	114.6	123.0	131.8	6.6%
Per Cap Other	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
Pct Change in Cons	4.8	6.8	5.8	7.0	6.7	6.9	7.1	7.0	7.0	6.9	

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COARSE GRAINS	BASE	MY1997	MY1998	MY1999	MY2000	MY2001	MY2002	MY2003	MY2004	MY2005	Ann Chg
Area Harvested	27857	29322	28913	29618	29899	30331	30730	31187	31702	32254	1.5%
Yield	4.37	4.50	4.61	4.70	4.82	4.94	5.06	5.18	5.31	5.44	2.2%
Production	121683	132047	133157	139170	144187	149760	155425	161590	168387	175552	3.7%
Beginning Stocks	27888	27399	28283	28867	29811	30680	31653	32696	33742	34833	2.2%
Imports	4100	3108	8373	11721	15697	20330	25734	31202	36970	43059	26.5%
Exports	1600	1550	1436	1356	1285	1205	1131	1075	1031	984	-4.7%
Consumption Demand	124673	133558	140330	149406	158539	168722	179793	191474	204034	217327	5.7%
Food Demand	32737	33332	32920	33061	33062	33394	33666	33872	34076	34410	.5%
Feed Demand	91936	100226	107411	116346	125477	135328	146126	157603	169958	182917	7.1%
Other Demand	0	0	0	0	0	0	0	0	0	0	
Ending Stocks	27399	28283	28867	29811	30680	31653	32696	33742	34833	35930	2.7%
WB Import Number	1800	2100	2700	2900	3600	4000	5600	7100	8500	9600	18.2%
WB Export Number	8000	7900	6900	7200	6000	5200	5100	5000	4500	4200	-6.2%
Consistency Checks:											
End Stks/Consumption	22.0	21.2	20.6	20.0	19.4	18.8	18.2	17.6	17.1	16.5	-2.8%
Food/Consumption Dmd	26.3	25.0	23.5	22.1	20.9	19.8	18.7	17.7	16.7	15.8	-4.9%
Imps/Consumption Dmd	3.3	2.3	6.0	7.8	9.9	12.0	14.3	16.3	18.1	19.8	19.7%
Exps/Production	1.3	1.2	1.1	1.0	.9	.8	.7	.7	.6	.6	-8.2%
Per Cap Production	99.1	106.5	106.4	110.1	113.0	116.4	119.7	123.5	127.7	132.2	2.9%
Pct Change in Prodn	.0	8.5	.8	4.5	3.6	3.9	3.8	4.0	4.2	4.3	
Per Cap Total Cons	101.6	107.7	112.1	118.2	124.3	131.1	138.5	146.3	154.7	163.7	4.9%
Per Cap Food	26.7	26.9	26.3	26.2	25.9	25.9	25.9	25.9	25.8	25.9	-.3%
Per Cap Food ex BA	23.8	23.9	23.2	22.9	22.5	22.3	22.0	21.7	21.5	21.2	-1.1%
PC Food ex BA Urban	23.8	24.2	23.3	22.9	22.3	21.9	21.5	20.9	20.4	20.0	-1.7%
prcpwh		.3	.0	.1	.1	.0	.1	.0	.1	.0	
prcpri		.2	.1	.1	.1	.1	.1	.1	.1	.1	
prcpcg		.3	-.6	-.3	-.4	-.3	-.3	-.3	-.4	-.3	
prcpba		.0	.0	.0	.0	.0	.0	.0	.0	.0	
pcdgdpur		-.2	-.2	-.2	-.2	-.2	-.2	-.2	-.2	-.2	
crpcfgtour		-.2	-.2	-.1	-.2	.0	-.1	-.1	-.1	-.1	
Total change		.4	-.9	-.4	-.6	-.4	-.5	-.5	-.5	-.4	
PC Food ex BA Rural	23.8	23.8	23.1	22.9	22.5	22.4	22.3	22.1	21.9	21.8	-.8%
prcpwh		.1	.0	.1	.1	.0	.0	.0	.0	.0	
prcpri		.1	.1	.0	.0	.0	.0	.0	.0	.0	
prcpcg		.2	-.3	-.1	-.2	-.1	-.2	-.2	-.2	-.2	
prcpba		.0	.0	.0	.0	.0	.0	.0	.0	.0	
pcdgdpru		.1	.1	.1	.1	.1	.1	.1	.1	.1	
crpcfgtoru		-.4	-.5	-.3	-.3	-.1	-.1	-.1	-.1	.0	
Total change		.0	-.7	-.3	-.4	-.1	-.1	-.2	-.2	-.1	
Per Cap Feed	74.9	80.9	85.8	92.1	98.4	105.1	112.6	120.4	128.9	137.8	6.3%
Per Cap Other	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
Pct Change in Cons	4.2	7.1	5.1	6.5	6.1	6.4	6.8	6.5	6.8	6.5	

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PORK	BASE	CY1998	CY1999	CY2000	CY2001	CY2002	CY2003	CY2004	CY2005	CY2006	Ann Chg
	Price exog-	0 (0=off;1=on)									
Slaughter*	515464	557949	593524	637993	682196	730020	781614	835240	892494	954593	6.4%
Yield	79.00	79.71	80.43	81.15	81.88	82.62	83.36	84.11	84.87	85.63	.8%
Production	40722	44475	47736	51775	55860	60314	65158	70255	75746	81746	7.2%
Production Region 1	2922	3191	3425	3715	4008	4327	4675	5041	5435	5865	7.2%
Production Region 2	7734	8447	9066	9833	10609	11455	12375	13343	14386	15525	7.2%
Production Region 3	2093	2286	2453	2661	2871	3100	3349	3611	3893	4201	7.2%
Production Region 4	5512	6021	6462	7009	7562	8165	8820	9510	10254	11066	7.2%
Production Region 5	14386	15712	16864	18291	19734	21308	23019	24820	26760	28879	7.2%
Production Region 6	8075	8819	9466	10266	11076	11960	12920	13931	15020	16209	7.2%
Imports	0	0	0	0	0	0	0	0	0	0	
Exports	222	257	303	359	426	512	619	748	907	1103	17.4%
prexpk		-20	-30	-36	-43	-47	-57	-72	-86	-108	
pcdgdp		104	120	142	169	202	243	296	360	440	
pcincome		-54	-62	-73	-86	-103	-122	-149	-179	-218	
mtexpkto(-1)		5	17	23	28	34	43	54	65	81	
Total change		35	46	56	68	85	107	129	160	195	
Consumption	40500	44218	47433	51416	55434	59802	64539	69507	74839	80643	7.1%
WB Export Number	225	229	235	239	243	248	253	259	264	268	
Consistency Checks											
Per Cap Production	33.2	35.9	38.1	41.0	43.8	46.9	50.2	53.7	57.4	61.6	6.4%
Pct Change in Prodn	4.4	9.2	7.3	8.5	7.9	8.0	8.0	7.8	7.8	7.9	6.0%
Per Cap Consumption	33.0	35.7	37.9	40.7	43.5	46.5	49.7	53.1	56.8	60.7	6.3%
PC Consumption Urban	33.0	34.0	34.4	35.0	35.5	36.2	36.8	37.3	37.9	38.5	1.5%
prcpbv		.0	.0	.0	.0	.0	.0	.0	.0	.0	
prcpmk		.1	.2	.1	.1	.1	.1	.1	.2	.1	
prcppk		-1.1	-1.4	-1.3	-1.4	-1.3	-1.4	-1.5	-1.5	-1.6	
prcplm		.0	.0	.0	.0	.0	.0	.0	.0	.0	
prcpfh		.0	.0	.0	.0	.0	.0	.0	.0	.0	
prcppl		.0	.1	.1	.1	.1	.1	.1	.1	.1	
prcpeg		.1	.1	.1	.1	.1	.1	.1	.1	.1	
pcdgdpur		1.3	1.4	1.4	1.4	1.4	1.5	1.5	1.5	1.6	
mtpcmttour		.6	.0	.2	.1	.3	.2	.2	.2	.2	
Total change		1.0	.4	.6	.5	.7	.6	.5	.6	.5	
PC Consumption Rural	33.0	36.3	39.3	43.1	46.8	50.9	55.3	60.0	65.1	70.7	7.9%
prcpbv		.0	.0	.0	.0	.0	.1	.1	.1	.1	
prcpmk		.1	.2	.1	.2	.2	.2	.2	.2	.3	
prcppk		-1.1	-1.5	-1.5	-1.8	-1.8	-2.0	-2.3	-2.5	-2.8	
prcplm		.0	.0	.0	.0	.0	.0	.0	.0	.0	
prcpfh		.0	.0	.0	.0	.0	.1	.1	.1	.1	
prcppl		.0	.1	.1	.1	.1	.1	.1	.1	.1	
prcpeg		.1	.1	.1	.1	.1	.1	.1	.1	.1	
pcdgdpru		1.3	1.5	1.6	1.7	1.9	2.1	2.3	2.5	2.7	
mtpcmttoru		2.9	2.6	3.3	3.3	3.4	3.9	4.2	4.4	5.0	
Total change		3.3	3.0	3.7	3.8	4.0	4.4	4.7	5.1	5.6	
Pct Change in Cons	4.4	9.2	7.3	8.4	7.8	7.9	7.9	7.7	7.7	7.8	5.8%
Imports/Consumption	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
Exports/Production	.5	.6	.6	.7	.8	.8	.9	1.1	1.2	1.3	9.5%

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POULTRY	BASE	CY1998	CY1999	CY2000	CY2001	CY2002	CY2003	CY2004	CY2005	CY2006	Ann Chg
	Price exog·	0 (0 = off; 1 = on)									
Production	8756	10031	11170	12638	14209	15986	17999	20236	22737	25638	11.3%
prpppl		200	346	342	411	434	507	587	659	742	
prcpco		58	-127	-61	-103	-93	-119	-147	-179	-165	
prcpri		-7	-5	-2	-3	-5	-4	-6	-5	-5	
prcpsm		-16	-5	-9	-16	-8	-13	-24	-17	-41	
mtdmplto		1041	930	1197	1282	1450	1643	1827	2043	2369	
Total change		1275	1139	1468	1571	1777	2014	2237	2501	2900	
Production Region 1	872	999	1112	1258	1414	1591	1792	2014	2263	2552	11.3%
Production Region 2	2055	2354	2621	2966	3334	3751	4224	4749	5335	6016	11.3%
Production Region 3	186	213	238	269	302	340	383	430	484	545	11.3%
Production Region 4	1827	2093	2331	2637	2965	3336	3756	4223	4745	5350	11.3%
Production Region 5	1530	1752	1951	2208	2482	2792	3144	3535	3972	4479	11.3%
Production Region 6	2287	2620	2917	3300	3711	4175	4701	5285	5938	6695	11.3%
Imports	170	193	219	250	287	331	383	446	521	613	13.7%
Exports	301	318	335	352	371	390	409	429	449	470	4.6%
Consumption	8625	9906	11055	12535	14125	15927	17973	20253	22809	25781	11.6%
WB Export Number											
WB Import Number											
Consistency Checks:											
Per Cap Production	7.1	8.1	8.9	10.0	11.1	12.4	13.9	15.5	17.2	19.3	10.5%
Pct Change in Prodn	12.6	14.6	11.4	13.1	12.4	12.5	12.6	12.4	12.4	12.8	.1%
Per Cap Consumption	7.0	8.0	8.8	9.9	11.1	12.4	13.8	15.5	17.3	19.4	10.7%
PC Consumption Urban	7.0	7.7	8.1	8.6	9.1	9.8	10.4	11.1	11.8	12.6	6.0%
prcpbv		.0	.0	.0	.0	.0	.0	.0	.0	.0	
prcpmk		.0	.0	.0	.0	.0	.1	.1	.1	.1	
prcppk		.1	.2	.2	.2	.2	.2	.2	.2	.3	
prcplm		.0	.0	.0	.0	.0	.0	.0	.0	.0	
prcpfh		.0	.0	.0	.0	.0	.0	.0	.0	.0	
prcppl		-.4	-.6	-.6	-.6	-.6	-.7	-.8	-.8	-.9	
prcpeg		.0	.0	.0	.0	.0	.0	.0	.0	.0	
pcdgdpur		.7	.8	.8	.9	.9	1.0	1.0	1.1	1.2	
mtpcmttour		.1	.0	.0	.0	.1	.1	.0	.1	.1	
Total change		.6	.4	.5	.5	.6	.6	.7	.7	.8	
PC Consumption Rural	7.0	8.1	9.1	10.5	11.9	13.5	15.3	17.4	19.7	22.5	12.4%
prcpbv		.0	.0	.0	.0	.0	.0	.0	.0	.0	
prcpmk		.0	.1	.0	.1	.1	.1	.1	.1	.1	
prcppk		.1	.2	.2	.2	.2	.3	.3	.4	.5	
prcplm		.0	.0	.0	.0	.0	.0	.0	.0	.0	
prcpfh		.0	.0	.0	.0	.0	.0	.0	.0	.0	
prcppl		-.4	-.6	-.6	-.8	-.8	-1.0	-1.1	-1.3	-1.5	
prcpeg		.0	.0	.0	.0	.0	.0	.0	.0	.1	
pcdgdpru		.7	.8	.9	1.0	1.2	1.3	1.5	1.8	2.0	
mtpcmttoru		.6	.6	.8	.8	.9	1.0	1.2	1.3	1.5	
Total change		1.1	1.0	1.3	1.4	1.6	1.8	2.1	2.3	2.7	
Pct Change in Cons	12.6	14.9	11.6	13.4	12.7	12.8	12.9	12.7	12.6	13.0	.3%
Imports/Consumption	2.0	1.9	2.0	2.0	2.0	2.1	2.1	2.2	2.3	2.4	1.9%
Exports/Production	3.4	3.2	3.0	2.8	2.6	2.4	2.3	2.1	2.0	1.8	-6.1%

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